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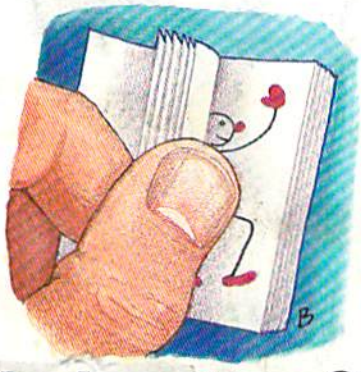

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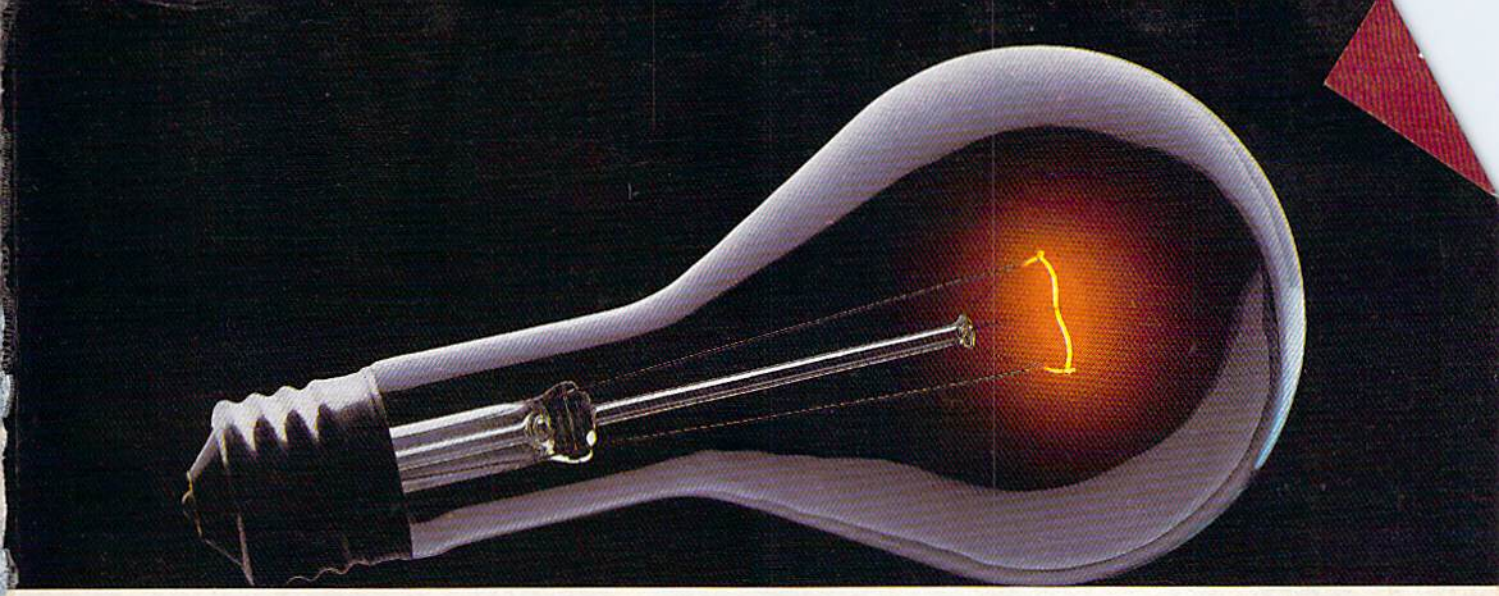

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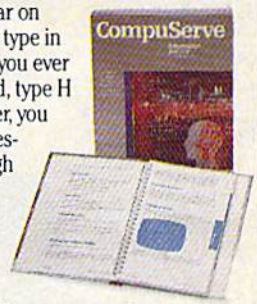

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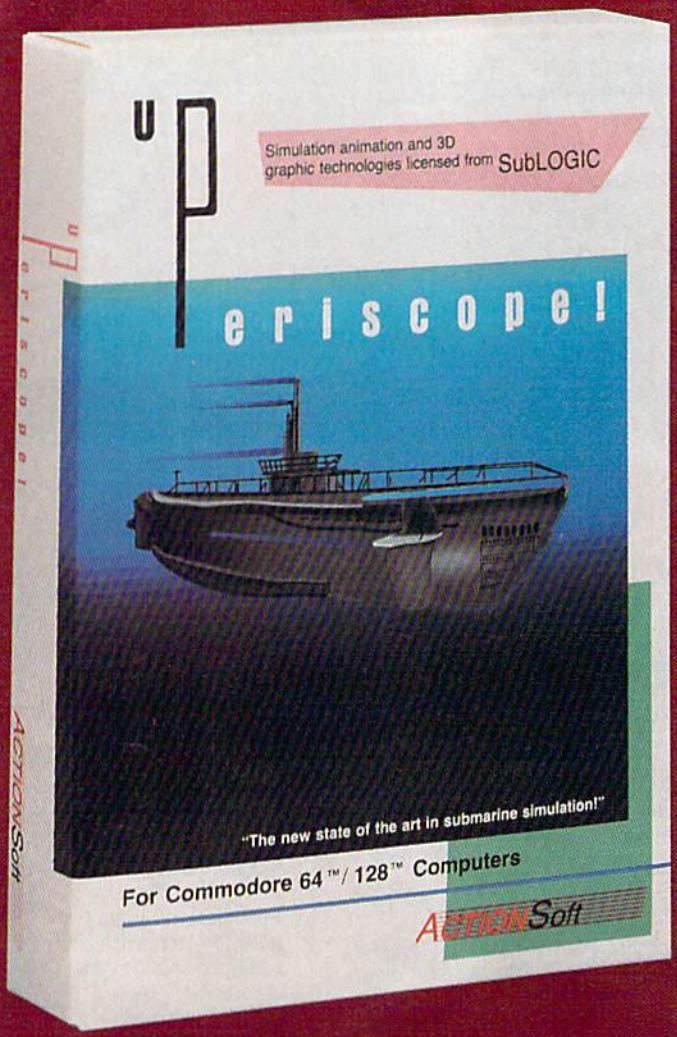
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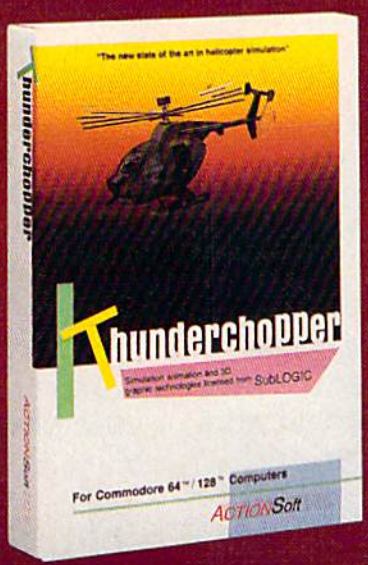
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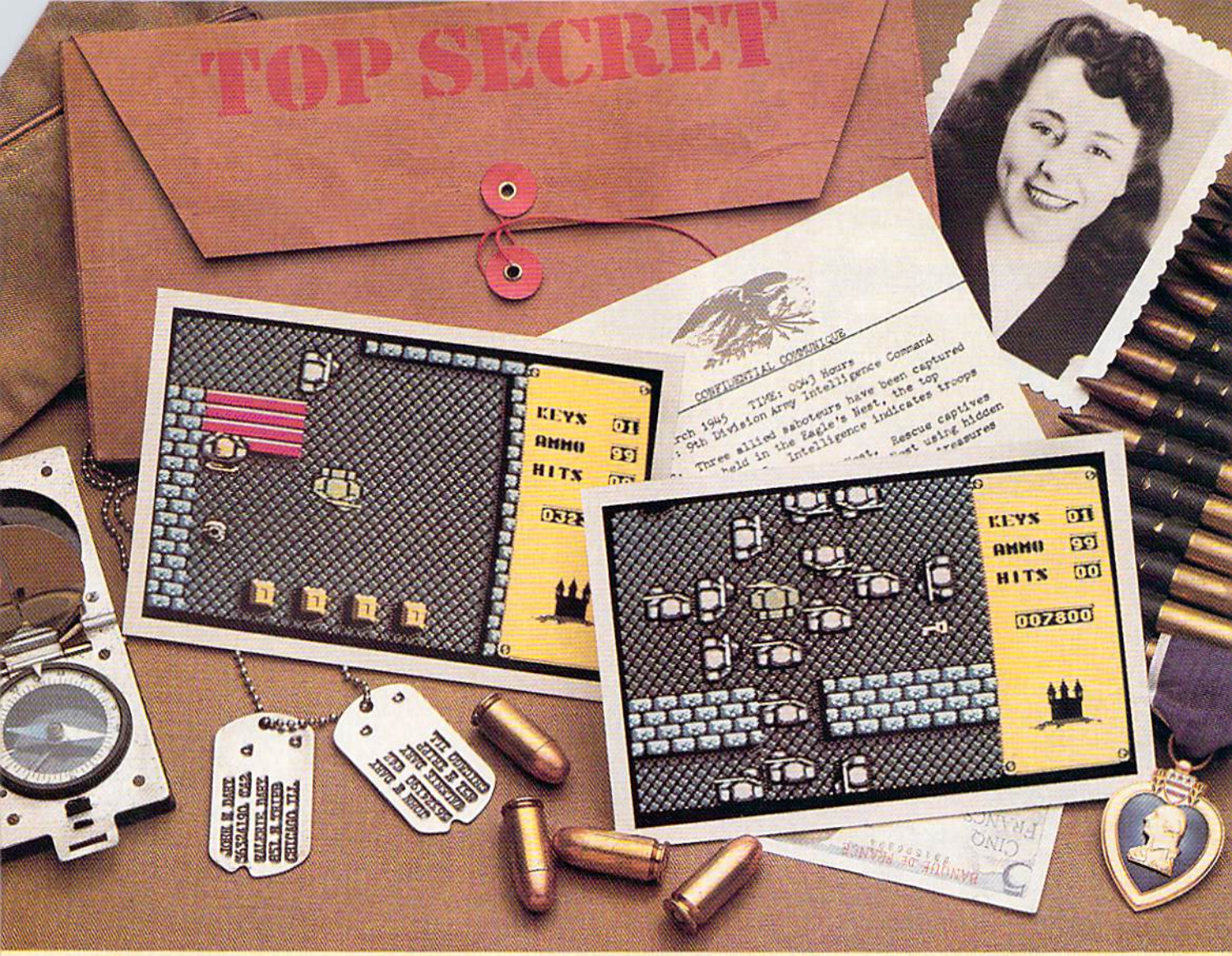

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editor's notes

Commodore is expected to announce a special new marketing plan for its Amiga computer. Gazette Editor, Lance Elko, considers the implications.

If you were following the fledgling home computer industry in 1982, you probably remember the debut of the VIC-20. With a price tag of $300, this 5K machine offered such features as a 22-column video display, a simple tone generator, and eight colors.

For an additional $600, you could purchase Commodore's 1540 disk drive. After spending $900, you would, of course, still need a monitor. A complete system configured this way, then, would be easily over $1,200. A state-of-the-art VIC system in 1982 is now, only five years later, technologically obsolete.

If you pause to think about what has happened in computer technology in just five years, you might need to catch your breath. The $1,200 spent in 1982 today buys an altogether different beast: You can now purchase a 20-megabyte hard drive for the 64 and come home with $200 in change; or you can buy a complete IBM PC compatible with 512K, dual drives, and color monitor; or buy an Amiga 500 with 512K, built-in disk drive, color RGB monitor, and 512K additional memory expansion, to boot.

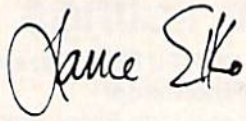
If you count five years of inflation, you could argue that today's $1,200 is 25 percent less in real purchasing power. But, for the moment, disregard inflation. Ignore the developments in video display technology, data storage and retrieval, and sound. Look, instead, at the vast five-year gulf in usable memory—RAM. Looking at Commodore's machines alone, a $300 VIC in 1982 provided the user with 5K, which translates to $60 per K. A $595 Amiga 500 today provides 512K, or $1.16 per K. Add the $200 512K expansion memory—for a full megabyte—and the cost is 78 cents per K. Granted, this is a narrow focus in a much larger picture, but it serves as an illustration of both how far we've come, and, perhaps, how far we can expect to go in the future.

It takes time for the mass market to adjust to the dizzying developments in state-of-the-art computer technology, and the rapid-fire changes do meet with resistance. Many owners are strongly loyal to the computer they use; many look at available software before they buy a new machine. When a new hardware technology emerges—such as the new generation of 68000-based machines, Amiga, Macintosh, and Atari ST—eyebrows are raised. Just when everyone gets comfortable with the prevailing machines, another question is asked: How much is enough? But that is a topic more fairly treated in a space much larger than this. Ultimately, though, the bottom-line pricing that results from the spiraling growth in computer technology cannot be ignored. Many devout VIC owners swore fast allegiance to their machines when the 64 emerged. But when prices dropped, allegiance grew cold.

Commodore 64 sales have been tapering off since its high-water mark in 1985, but this computer has continued to surprise even the most jaded cynics. The 64 will continue to be a viable machine in the years to come—the huge installed base plus the massive amount of software assure this. But what does Commodore make of its spectacularly successful machine? Will it continue to support the 64? There are now strong clues. It is certain that Commodore will continue to offer, at the least, passive support. But, at this point, it's easy to deduce that Commodore is putting its marbles in the Amiga's ring.

We've had word of a special promotion—running from mid-August through the end of October—in which Commodore appears to be aggressively pursuing the idea that the Amiga 500 can replace the 64 and 128 in the hearts and minds of Commodore owners. And Commodore knows that perhaps with no other computer manufacturer is brand loyalty a greater factor than with Commodore owners. Commodore is expected to offer, at half price, one Amiga 500 system to every Commodore user group—the vast majority of which are comprised of 64 and 128 owners. For $999, the package will include the 500, 1080 color monitor, 1680 modem, additional external disk drive, and 512K expansion memory.

Also, each user-group member will receive a coupon redeemable at the time of an Amiga 500 purchase. The coupon offers two plans. The first plan bundles *Deluxe Paint II, PageSetter, TextCraft Plus, Aegis Animator, Marble Madness,* and the Epyx 500XJ joystick, all for only $99. The other plan, at $199, gives the buyer *Word Perfect, PageSetter Deluxe, Superbase, MaxiPlan 500, Deluxe Video, Diga,* and *CLImate.* This may be the most aggressive promotion ever run by Commodore. And targeting Commodore user groups makes it clear that the company thinks it can sell the Amiga to the audience already loyal to the tremendously popular 64.



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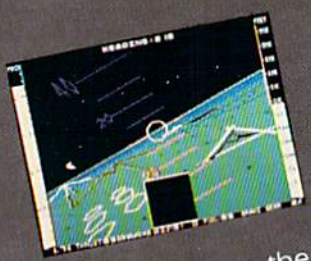

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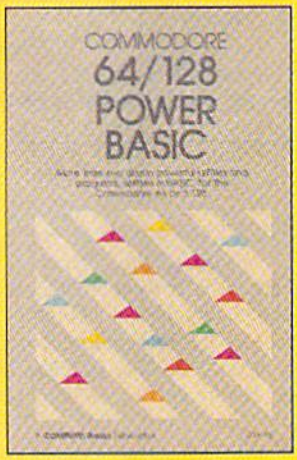

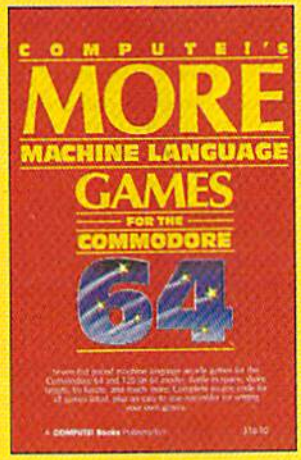

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Saving In The Middle Of A Game

I have a problem with the game *Elite* on my 64. It will not load a new commander or save a current position to disk. Whenever I try one or the other, the disk drive starts running, but shuts down after a few seconds. The red light starts flashing, and the screen tells me a disk error has occurred. I have no trouble loading or playing the game—just saving it. Any suggestions?

K.P. Schmitt

The most likely cause for your problem is that the game is trying to save to disk, but the disk in your drive (the original game disk) is write-protected. Try saving to another disk, one that has an uncovered write-protect notch.

It's not a good idea to save programs or files to original commercial disks, even if the directory shows you that there's room available on the disk. Commercial programs sometimes use unusual disk formats, or the disks may contain sectors with deliberately placed errors. If you save to a commercial disk, you risk damaging or altering important information needed by the program.

Logic AND Bits

I have studied many books about programming, but I still have trouble with AND and OR. I understand they turn bits on and off, but I don't understand what is happening.

Thomas F. Sayles

The BASIC operators AND and OR can be used in logical operations or in bitwise operations. The logical type of AND and OR appears in lines such as this:

```
20 IF (A=15) AND (B>C) THEN D=17
51 IF (Z<>ABS(X)) OR (SIN(X)<.15)
   THEN 150
```

The equation A = 15 is either true or false. The computer looks up the value of variable A and stores it in a work area. Then it converts the characters 1 and 5 to a compatible floating-point format, stores that number in a work area, and compares the two numbers. One way to check for equality is to subtract one number from another. If the answer is 0, the two numbers are equal. Any other answer means they're unequal.

After judging the truth value of the first statement, the computer checks the truth of the second statement. Within a logical AND operation, both comparisons must be true for the compound statement to be true. If one (or both) of the inputs is false, the entire statement is false. Here are truth tables for AND and OR:

```
True AND True = True
True AND False = False
False AND True = False
False AND False = False

True OR True = True
True OR False = True
False OR True = True
False OR False = False
```

As you can see, the only time that an AND statement is true is when both elements are true. The only time an OR statement is false is when both sides are false.

A bitwise operation is very similar, but instead of using equations that could be true or false, you're working on individual bits that could be 1 or 0. In the truth tables above, substitute a 1 for true and a 0 for false. For example, 1 AND 1 = 1 or 0 OR 1 = 1.

Computers store information in memory in groups of eight bits. Each bit can be on or off (1 or 0). The number we call 179 (in base 10) appears in computer memory as 10110011 (base 2). The expansion looks like this:

$179_{10} = (1 * 10^2) + (7 * 10^1) + (9 * 10^0)$
$= 100 + 70 + 9$
$10110011_2 = (1 * 2^7) + (0 * 2^6) +$
$(1 * 2^5) + (1 * 2^4) + (0 * 2^3) + (0 * 2^2)$
$+ (1 * 2^1) + (1 * 2^0) = 128 + 0 +$
$32 + 16 + 0 + 0 + 2 + 1$

From the computer's point of view, the base 10 method of counting 100 + 70 + 9 is just another way of saying 128 + 32 + 16 + 2 + 1. The values are exactly the same; there are just two different notations for expressing the number.

The rightmost bit represents a value of 1; it's called bit 0. *The leftmost bit represents a value of 128; it's* bit 7. *Individual bits sometimes control important functions. Here's where bitwise operations come in.*

For example, bit 3 of location 53270 on the 64 controls whether the screen displays 38 or 40 columns. If it's on, you see 40 columns. If the bit is off, there are only 38 columns. Location 53270 isn't RAM, ROM, or any other kind of memory. It's a register on the VIC-II chip, which handles graphics such as sprites, text, and hi res.

To change the screen to 38-column width, we must turn off bit 3. But we don't want to modify the values in the other bits. The AND command can handle this task: ***POKE 53270, PEEK(53270) AND 247****. Where did the 247 come from? A binary translation of 247 is 11110111. As you can see, this value has seven bits turned on; only bit 3 (the fourth bit from the right) is off. When you AND another value with 247, bit 3 of the result will be off and the rest of the bits will be copied unchanged to the answer.*

To return to 40 columns, you must once again turn bit 3 on. This can be done with the line ***POKE 53270, PEEK(53270) OR 8****. The value 8 in binary is 00001000. In this value, only bit 3 is on. When you OR another value with 8, bit 3 of the result will be on and the rest of the original bit settings will be unchanged. AND and OR are complementary functions. AND turns bits off and OR turns them back on again.*

Timing The Disk Drive

The Commodore 128 *Programmer's Reference Guide* says that disk input/output (I/O) happens at the same speeds in FAST and SLOW modes. I decided to test this with the program

```
10 TI$="000000": DIRECTORY: PRINT
   TI
```

I ran this program in FAST and SLOW mode, with 40 and 80 columns, and with a 1541 and 1571 disk drive. Here are the results.

1541 drive

	40 col.	80 col.
SLOW	43	51
FAST	31	40

1571 drive

	40 col.	80 col.
SLOW	27	37
FAST	17	25

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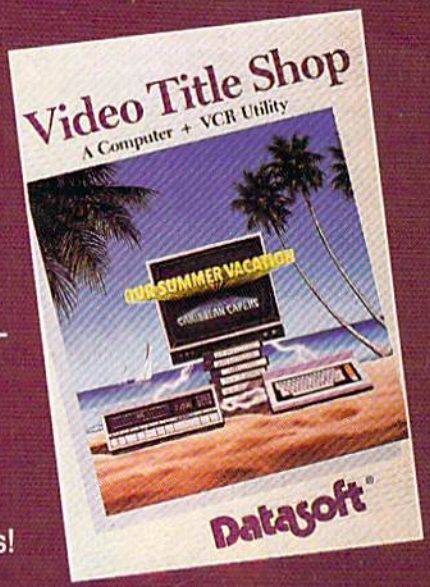

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You will notice that the 40-column SLOW mode is roughly the same speed as the 80-column FAST. Why is this?

Simon Sabato

The benchmark program you wrote is short and simple and you've got the right idea, but there are two factors that make it an unreliable way of testing the speed of disk I/O.

The first problem is that the jiffy clock (which uses the reserved variables TI and TI$) is a software clock. The jiffy counter is updated during a system interrupt that is triggered every 1/60 second. But disk access turns off all interrupt requests, so the clock doesn't click while the computer is talking to the disk drive. Using TI and TI$ to check disk speeds is like timing a race with a stopwatch that sometimes just stops for a brief time—but only when the race is in progress. More reliable timers are the time-of-day (TOD) clocks built into the two CIA chips.

The second problem is that DIRECTORY is unsuitable for testing pure disk access. A major component of the DIRECTORY command is printing the disk directory on the screen. If you test the PRINT statement (by printing "HELLO" 1000 times, for example), you'll see that it works roughly twice as fast in FAST mode.

Here's a new benchmark to try. The TOD clock in the first CIA chip times the results; the four numbers you see are hours, minutes, seconds, and tenths of seconds. The BLOAD command just loads a file into memory (in this case at location 8192 in bank 0).

```
10 FAST:GRAPHIC CLR:BANK15
20 FORJ=56331TO56328STEP-1:POK
   EJ,0:NEXT
30 BLOAD"FILE",B0,P8198
40 FORJ=56331TO56328STEP-1:Z=P
   EEK(J):PRINTHEX$(Z),:NEXT
50 SLOW
```

The results for 40 columns, 80 columns, FAST mode, and SLOW mode are almost exactly the same. For a program that uses 58 sectors on the disk, the 1571 finished in 7.2 seconds. In 1541 mode, the 1571 needed 40.2 seconds to load the program. To put the disk drive into 1541 mode, enter **OPEN 15,8,15, "U0>M0"**. *To go back to 1571 mode, change the command to* **"U0>M1"**.

Animating Sprites

How do you animate sprites using different frames on the 128? The manual explains only how to move a sprite across the screen.

Kelly Ruel

The 128's SPRSAV command can save a sprite shape into a string variable and vice versa. This gives you the power to create a series of sprites and transfer the shapes one by one into a sprite on the screen. For example, you could draw three shapes in sprites 2, 3, and 4, then save them with this line: **FOR X = 2 TO 4: SPRSAV X, A$(X): NEXT**. *Then use SPRITE and MOVSPR to display sprite 1:* **DO: FOR X = 2 TO 4: SPRSAV A$(X), 1: SLEEP 1: NEXT: LOOP**.

The 64 does not have a SPRSAV keyword, so you have to manipulate the sprite pointers that are found at locations 2040–2047. If you happen to move screen memory to a new area, the sprite pointers also move. They're always found 1016 bytes past the beginning of the 1000 bytes of screen memory (in hi-res mode, they're 1016 bytes past the start of the color area).

To animate sprites on the 64, first you create the shapes and place them in memory (the starting location of each sprite must be an even multiple of 64). Changing shapes involves changing the pointers. If you have two shapes, at 832 and 896, then to select the first shape for the first sprite, **POKE 2040,13**. *To change to the second,* **POKE 2040,14**.

Adding RAM To The 64

What would be the effect of the new 1764 RAM expander on my word processor? It presently has a capacity of about 20 pages, but, after about 12 pages, the whole process slows down. Typing is mushy, formatting takes longer, and so on. Would the RAM expander increase the page capacity or decrease the delays? Is the capacity and speed of the word processor related to RAM availability, programming, or the internal ability of the 64?

Don Ryerson

The 1764 expander probably wouldn't have much effect on the speed or memory of your word processor.

The 6510 processor, which is the brain of the 64, can address a maximum of 64 kilobytes of memory at any one time. Even if you added 20 megabytes, the 6510 could only read and write to 64K. To a limited degree, you can shuffle memory around (to access the RAM under ROM, for example) but the 64K limit is a fixed quantity.

Readers who remember memory expanders for the VIC-20 might think the 256K expander for the 64 is similar. It's not. The VIC only had 5K of RAM to begin with—3.5K of which was available to BASIC programmers—and its 6502 processor could address 64K. It was possible to install memory that added to the main addressing space. If you had 3.5K of available memory and added an 8K expander, the VIC-20 would give you 11.5K of available memory. On the 64, all 64K is already installed, so plugging in the 1764 doesn't add to the primary section of memory. When you turn on an expanded 64, it still says 38911 bytes are available.

You can think of the 64's expander as a sort of super-fast disk drive. You can copy a hunk of memory from the 64 to the expander (which is what the 128's STASH command does), or you can copy from the expander to the 64 (FETCH on the 128). These options are the equivalent of SAVE and LOAD with a disk drive. A third option swaps two sections of memory between the 1764 and the 64. The memory expander is much faster than a disk drive, completing a fetch, stash, or swap in less than 1/10 second.

The authors of your word processor probably didn't know about or have access to the RAM expander when they wrote the program. Thus, adding the memory probably wouldn't have any effect on its speed or capacity. Applications that don't specifically support the extra memory can't use it.

Rumor has it that a few software companies are adapting their software to use the memory expander (most are database programs, word processors, and similar applications). Other programs, like the latest version of GEOS, *already support the 1764.* geoPaint *is much faster when the expander is installed. In addition, you can write your own programs that take advantage of the memory. Finally, the 1764 comes with a ramdisk program that's useful for making backup copies of programs (or entire disks).*

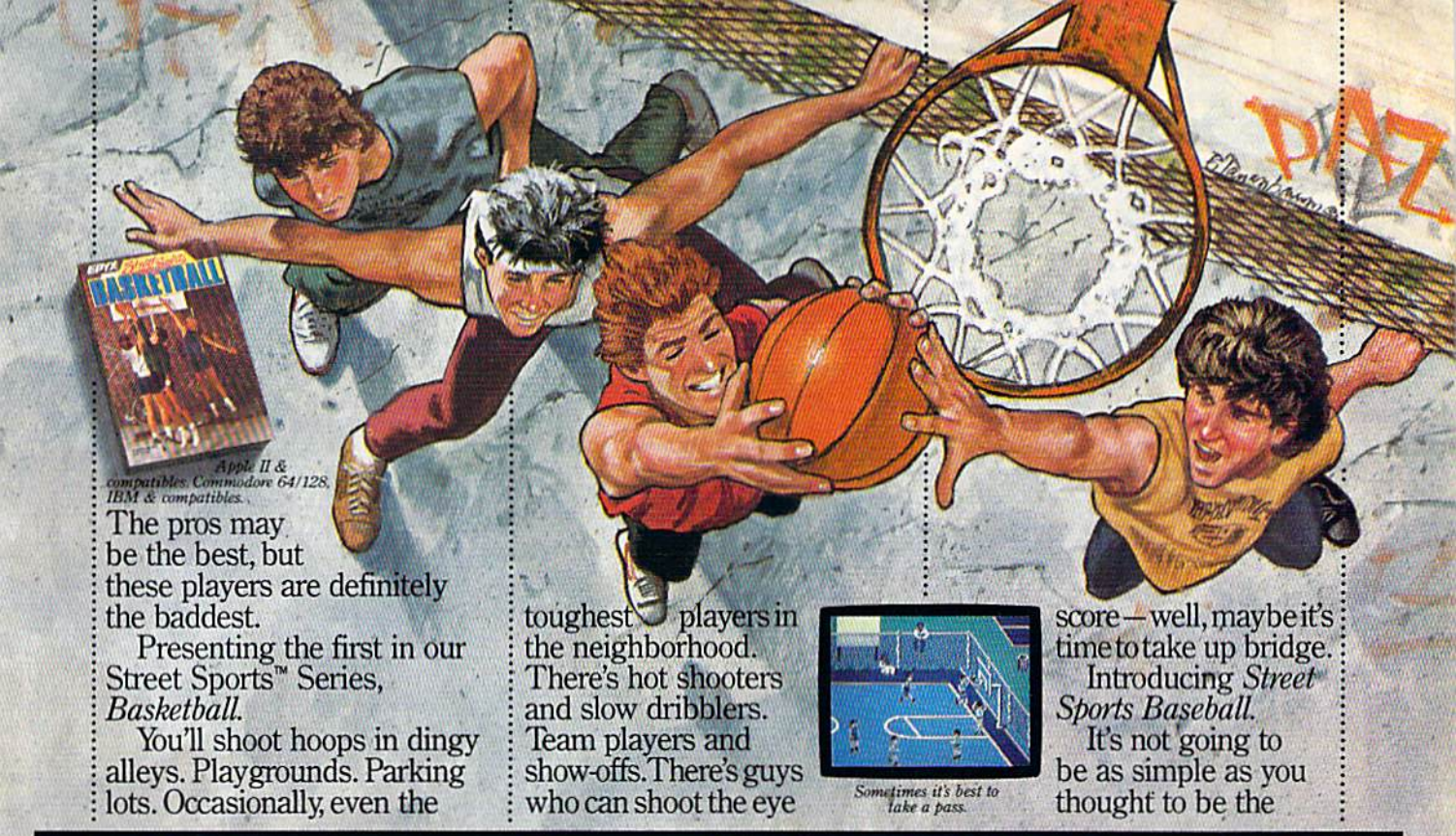
Drives, Monitors, And Disks

I own a 64 with a 1541 disk drive. I plan to upgrade to a 128 with a 1571, but I have a few questions. First, I've read that the 1541 is compatible with the 128 in all modes; it's just slower than a 1571. Is this true? Second, I've heard that the 1902 and 1902A are good monitors for the 128, but I can't seem to find out the difference between them. Do you know? Third, I plan to subscribe to the GAZETTE Disk. If I say I have a 128, will I get the programs each month for the 128 *and* the 64 or just the programs for the 128 in 128 mode?

Reginald C. Gray

The 1541 works with the 128 in 64 mode, 128 mode, and CP/M mode. As you noted, it's slower than the 1571. The 1571 uses both sides of a disk, which gives you 1328 blocks free on a newly formatted disk, versus one side and 664 blocks on the 1541 drive. The 1571 is also capable of reading CP/M disks formatted on the Osborne, Kaypro, and Epson computers, which is not possible on the 1541 (an important factor if you plan to use CP/M mode, because most public domain and commercial CP/M disks are formatted for Osborne or Kaypro). You'll be able to use the 1541 in all three modes, but you won't be able to read CP/M disks from other computers.

The 1902 and 1902A monitors both carry the Commodore label, but they're actually made for Commodore by a second



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company. This is a common practice in the computer business, especially in certain areas like monitors, disk drive mechanisms, and modems. The two monitors are virtually identical, although they were manufactured by two different companies. Both display 40 or 80 columns on the 128, and both work with the 64. Some people have claimed that the 1902 has a sharper picture than the 1902A, but it seems to be primarily a matter of personal preference.

There's only one version of the GAZETTE Disk. It contains all the 64 and 128 programs from the corresponding issue. There are separate menus for each machine.

A Shifty Character

I own a Commodore 64, and I'm perplexed by an item in a previous Feedback column. You mentioned that by PEEKing location 653 ($28D) it is possible to detect the SHIFT, CTRL, and Commodore logo keys being pressed.

I've noticed that a value of 1 is returned regardless of which of the two SHIFT keys is pressed. Some commercial software can detect which SHIFT key is being held down. How is this done?

Michael Seales

The keyscan routine built into the 64 operating system does not differentiate between the two keys, so it's not as easy as reading a location. You have to perform your own keyscan routine to do this. Try the following program. It turns off interrupts to keep the system keyscan routine from interfering with ours. Within the loop, we repeatedly check the left SHIFT key, then the right. Details on how to scan for a particular key can be found in Mapping the 64, *from COMPUTE! Books.*

```
3 POKE 56333,127
5 FOR T=1 TO 100
20 POKE 56320,253:IFPEEK(56321
   )=127THENPRINT"LEFT SHIFT"
25 POKE 56320,191:IFPEEK(56321
   )=239THENPRINT"RIGHT SHIFT"
40 NEXT T
50 POKE 56333,129
```

Bugs In The 128

Locations $D600 and $D601 (54784 and 54785) in bank 0 are changed whenever the CHAR command is used. I have found that these locations are the ones used in addressing the 80-column chip. As you might expect, the locations are *not* changed when you're using CHAR in 40-column mode. Incidentally, the locations aren't affected by the PRINT command in 80-column mode. The bug only occurs when you're in 80-column mode and you use CHAR.

Richard A. Raisley

I think I have discovered a minor bug in the 128. If you turn on the 128 and run the following program, you get a syntax error in line 30.

```
10 DEF FNRO(Z)= SIN(Z)
20 GRAPHIC 1,1
30 X = FNRO(1)
```

If you run it a second time, without doing anything else, the program works properly. Moreover, if you type GRAPHIC CLR and run the program a third time, you're back to an error.

Probably the bug is that the GRAPHIC command doesn't take care of the DEF FN statements and you must allocate the graphics area before defining your functions.

Dalla Torre Paolo

There is a subtle bug in the "DOS Shell" program for the 128 on the *Test/Demo* disk provided with the 1571 disk drive. The file copy routine seems to make good copies, but the files are actually one byte longer than the originals. A garbage byte has been added. This happens with USR, PRG, and SEQ file types (I haven't tested REL files); it happens on 1541 and 1571 drives; and it

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happens with every copy I've made—40 or more—while figuring this out.

Most of the time, a few extra bytes at the end of a BASIC program won't matter. But a data file with the wrong length might be unusable, and a machine language program that's too long might overwrite important locations.

Nicholas G. D. Old

Commodore has released the new ROMs for the 128 and 1571. Owners of older 128s or 1571s can obtain the ROMs from a Commodore dealer or directly from Commodore.

According to an unofficial list of bugs that have been fixed, the problem with CHAR and the 80-column chip has been solved. The 128 didn't previously switch in bank 15 as it should have before attempting to execute CHAR.

The DEF FN bug can be explained (but not excused) by the way functions are handled by the computer. After being defined, the function name is entered in the list of variables, with a pointer back to the definition's location within the BASIC program in memory. The GRAPHIC command makes 9K of memory available for the hi-res screen by moving the BASIC program currently in memory. When the program is moved, the pointers for defined functions should be changed, but they're apparently not. The solution, therefore, is to allocate a graphics area before defining functions. For example, if you plan to include DEF FN, add the line ***GRAPHIC 1: GRAPHIC 0*** *at the beginning of the program before any functions are defined.*

The bug in the file copy routine isn't easily solved, except to avoid using that program for making backups. There are many disk- and file-copying programs available, both commercially and in the public domain. Also, several utilities for making backups have been published in COMPUTE!'s Gazette.

One-Key Load And Run

There's an extremely simple way to load and run the first program from disk using a 128: Just press SHIFT and RUN/STOP together, then wait while the program loads and runs. It seems odd that this is apparently not discussed in the *System Guide*. Is it really undocumented?

Bob Tischer

For years, Commodore computers have been able to run the first program after detecting the SHIFT-RUN/STOP key combination. The Commodore PET computers with BASIC 4.0 run the first program from disk. The VIC and 64 run the first program from tape. And the 128 goes to the disk drive for the first program that's listed in the directory. Note that this is not the same as a 128 boot sector, which automatically loads and runs a program from disk when you turn on the computer.

Although this feature doesn't seem to be mentioned in the System Guide, *the omission is probably inadvertent. Another book by Commodore, the* Programmer's Reference Guide, *covers various programming details of how to use the function keys. The new Kernal routine PFKEY, available in the 128, but not in the 64, can reprogram any of the eight function keys F1–F8, for example. The SHIFT-RUN/STOP key combination is treated as function key 9.*

The SHIFT-RUN/STOP combination is useful if you want to load and run the first program on disk, but the effects can be disastrous if you're in the middle of writing a program and accidentally press the key combination, thereby loading a program on top of your work. Whatever you haven't saved is lost. To prevent this, you can put a short SEQ file as the first file on disk, since sequential files can't be loaded. You could also redefine the SHIFT-RUN/STOP string so it won't perform a DLOAD.

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Commodore Computers:

An Overlooked Educational Opportunity?

Keith Ferrell, Features Editor

That the Commdore 64 and 128 offer exceptional performance for their price is no secret. What's mysterious is that schools have not bought them at anywhere near the rate that they have been bought by the general public. Why aren't there more of these affordable, versatile Commodore machines in our classrooms? There are signs that in the months to come, all this may change.

According to a recent article in *USA Today*, which drew upon several sources, 12 percent of the computers in public schools are Commodore machines. While Commodore's share of the school market pales beside Apple's whopping 58 percent, the company compares well relative to other computer manufacturers. Tandy, perhaps the most energetic of companies going after the education market with MS-DOS machines, holds only 14 percent; IBM itself has, at 6 percent, only half as many classroom machines as Commodore.

One explanation for the continued success of the 64 and, to a certain extent, the 128, is their affordability. The sharp decline in the prices of other computers, especially MS-DOS machines, has still not brought them down to the price point of the 64.

But the education market is fiercely competitive, and even a 12 percent market share can quickly erode. Can Commodore, now without an educational marketing division, continue to find classroom success for its 64s and 128s? Many people think it can.

Serving The Market

Commodore is now moving aggressively after the education market, notes Richard McIntyre, the company's senior vice president of marketing and sales. "Education is an area of the market we were tremendously successful in early on," he says, "but, perhaps because of our lack of DOS capability, it's an area we didn't capitalize on as we should have."

Now, of course, Commodore is able to offer its own MS-DOS-compatible computer, the PC-10, as well as the Amiga line with its many advanced features that step beyond the technology of the eight-bit machines. "For dealers and educators aligned with Commodore," McIntyre points out, "we offer the most versatile product line in the industry."

With machines addressing every educational microcomputer niche, McIntyre feels confident that Commodore's presence in the market will grow. "Unquestionably, our share of the school market will increase over the next 12 months," he states.

While there is excitement about the company's new machines, the 64 and the 128 continue to sell to schools as well as to consumers.

Lilly Meizner Toback is corporate director of Meizner Business Machines, a 44-year-old firm that provides educational hardware and software to many of the major school systems in the Northeast. Toback's company has been a Commodore dealer for more than a decade, and ten years ago it began selling the company's PET computer to public school systems.

Today, she continues to supply those markets with Commodore machines. In the face of aggressive compatibles manufacturers and Apple's strong educational marketing program, Toback has sold thousands of 64s and hundreds of 128s to schools over the past few years.

"Commodore's affordability," notes Toback, "allows school systems to provide hands-on experience to a large number of students at a reasonable cost." With many school systems facing severe constraints on their budgets, Commodore's combination of features and price continues to exert a strong appeal.

Making The Price Point

Commodore itself is aware of the price advantage that 64s and 128s bring to the educational marketplace, and the company stresses that advantage in situations where large numbers of computers are called for.

Richard McIntyre puts it bluntly. "If the *modus operandi* is more machines for more students, then 64s and 128s make tremendous sense. They are, simply, the most cost-effective way for school systems to use the limited number of dollars available for computers in the classroom."

That cost-effectiveness increases as larger numbers of computers are sought. "Schools are looking at putting more and more

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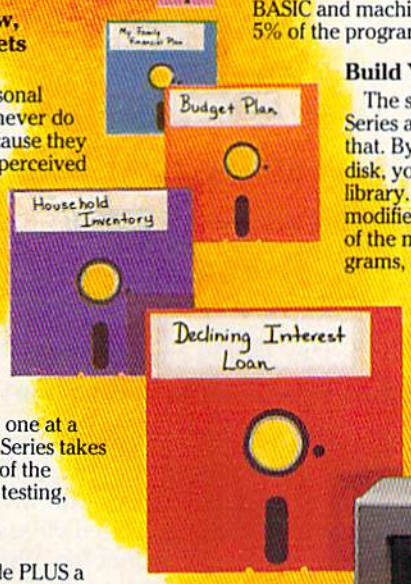

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computers in each classroom," says Joseph Marlino, presently a member of Commodore's sales training division, but formerly involved in the company's educational marketing. "You can fill an entire classroom with 64s for far less than other machines."

Price And Features

Price alone is not enough, even in an environment as constrained by budget as education. But Commodore proponents make clear that the 64 is competitive in areas other than the balance sheet.

"For a very reasonable price," observes Lilly Toback, "the 64 provides music, sprites, color graphics, and a full ASCII keyboard. It's a powerful machine that affords students lots of hands-on contact with many aspects of computing."

Joe Marlino notes that the 64 offers many advantages for younger students, particularly those encountering a computer for the first time. In addition to being a very "friendly" machine, he points out that the 64's 40-column screen allows for the generation of oversized characters.

"The graphics and sound capabilities continue to delight students," Marlino says, "especially younger ones."

A Huge Software Base

The success of any educational computer depends on the amount of effective classroom software developed for it. So far, despite the growing presence of machines with larger amounts of memory, developers have continued to include the 64 among the machines on which their programs can run.

Commodore's McIntyre feels that the enormous base of 64 software more than validates the effectiveness of the machine as an educational tool. "We need to stop thinking of computers as anything other than software delivery vehicles," he asserts. "And once you see the computer that way, Commodore's machines become the most affordable way for schools to deliver applications to students."

"We still continue to support the 64," says Cathy Carlston, vice president of educational market planning for Brøderbund, a major software publisher with many significant educational titles, "and we continue to find pockets of educational use for the machine." She notes that many of those pockets are on the East Coast. "Canada is also a strong market for 64 educational software," Carlston observes.

Lilly Toback points out that educational software for Commodore's machines extends across all curriculum lines. "There's a very large base of educational programs in every subject area," she points out. "Also, there's a lot of graphics and music software that can be used very effectively in the classroom."

Toby Koch, president of Golden Hedge, an educational hardware and software dealer and consulting firm that represents a broad range of computers and software, sees continued potential for Commodore's machines. She points out that to understand the effectiveness of the 64 as an educational tool, the machine needs to be viewed from the perspective of educational software's evolution.

We need to stop thinking of computers as anything other than software delivery vehicles.

Unto Each Generation

"We've been through four generations of educational software already," Koch explains. "First there was software that carried the mandate of making students computer literate, that taught programming languages. This was the generation of Logo."

Koch continues, "The second generation was essentially electronic flashcards and magic markers, not very exciting either as software or educationally. The third generation included programs like *Writer Rabbit*, that incorporated the use of software throughout the scope and sequence of the curriculum."

Today, we are entering the fourth generation of classroom-oriented programs. "Now software is used to turn the computer into a time-management and productivity tool for word processing, idea processing, for developing the content and conceptualization of an idea, and for number management including spreadsheets and databases."

Where do Commodore's eight-bit machines fit into this multigenerational picture?

"For the early generations of software," Koch states, "in terms of color, sound, and graphics, the Commodore 64 is superior to both the Apple II and its Franklin counterpart."

What about the new generation of productivity software? Koch says, "The 128 system has a lot to offer. There's the rich array of 64 software that the machine can run, plus providing the power, performance, and capability of an 80-column machine."

Noting that the 128 is among the most popular educational computers in Europe, Richard McIntyre suggests that its versatility is underappreciated at home. "The 128 offers the same disk capacity as a PC," he points out, "and depending on the group in the classroom, it can satisfy the need for strong graphics and sound, or for 80-column mode in a business curriculum."

Homework

Commodore's 12-percent penetration of the school market does not come close to reflecting the company's popularity with consumers. *Business Week*, for example, recently estimated that nearly one-third of all computers in American homes are Commodore 64s.

The fact that there are so many 64s in homes is seen by some as an educational opportunity in itself. Commodore's Marlino feels that some schools appreciate the 64's substantial penetration of the consumer market. "With millions of 64s in homes," he says, "students are able to reinforce at home the work they did in the classroom."

Lilly Toback makes a similar point. "Commodore's price range allows many students to have a machine at home. This, in turn, gives them the opportunity to transfer

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some of their learning from school, to extend not just classroom work, but familiarity with computers in general."

Toby Koch suggests that Commodore owners could make more effort in encouraging schools to consider 64s and 128s. "Users have a responsibility," she says, "to insure that the experience they have chosen for their children and themselves has the opportunity to be part of the educational landscape."

Enter *GEOS*

Have schools missed an opportunity by neglecting the 64? Brian Dougherty, president of Berkeley Softworks, thinks so.

"The 64 is definitely an overlooked case," he says in reference to that computer's position in many school systems. Dougherty notes that Commodore's much-publicized business trials over the last few years may have caused some educational equipment buyers to shy away from purchasing the machines.

Berkeley's own *GEOS* package, which offers a wide variety of applications for the 64, has helped to spark a resurgence of educational interest in the machine. The fact .hat *GEOS* is now included with all 64C computers means that the already affordable machine now comes bundled with precisely the sorts of productivity software that teachers are looking for.

As Dougherty himself points out, "Schools that passed on the 64 were making pre-*GEOS* decisions." Now, with *GEOS* in place, Dougherty is staging an even more closely targeted approach to the education market.

Networks Needed

Berkeley Softworks is now making an early and perhaps preemptive entry into classroom networking with its new *geoNet*. Brian Dougherty reports that with *geoNet* a powerful educational workstation consisting of a 64, a monitor, and a *geoNet* expansion card can be installed for as little as $500.

While *geoNet* will also be ported to the Apple II, its effectiveness in networking 64s may cause educators to look again and more closely at that machine's classroom potential. The hardware card responsible for *geoNet*'s Input/Output and for linking the 64 to the network also takes the place of individual disk drives, eliminating the problems that can be caused by the distribution of individual floppies throughout a classroom.

"Each network hardware card contains a 512K RAM expansion unit," Dougherty explains. The unit essentially creates a ramdisk on each student's computer, providing plenty of space for files to be downloaded from the teacher's hard disk."

All Together Now

"All of the systems in the class will boot off the teacher's disk automatically," Dougherty notes. "And on the hard disk each student can have his or her own directory."

A student who learns to enter data on a Commodore can enter data on an IBM or a Wang.

There are *geoNet* applications and opportunities beyond the individual classroom as well. These capabilities loom large as technology moves into an era of large-scale information storage by way of hardware including Compact Disc Read Only Memory (CD-ROM). The implications of CD-ROM are huge—a single disc, for example, can store an entire encyclopedia and more. Students will be able to access millions of words of text, hundreds of thousands of pictures, as well as sound and music libraries.

Enough Memory?

Can a 64K computer continue to satisfy educational needs in an era of ever-expanding memory? "Absolutely," says Richard McIntyre.

"In fact," he continues, "in certain grade levels, anything more than 64K is questionable." McIntyre points out that Commodore's 1764 RAM expander offers an additional 256K for schools demanding increased memory, but returns to his original point. "Some schools are spending a lot of money to buy features that they don't need. Students, especially in grades K through 6, don't need a minicomputer. Too much memory for lower-grade applications is like driving a nail with a jackhammer."

Another marketing challenge the company faces is the growing insistence that educational computers be compatible with those of the "real" world, the business world. Because that world is overwhelmingly dominated by IBM and MS-DOS machines, many advocates feel that students should learn on PCs with DOS and collateral software.

"People who are so hardware-specific have lost sight of what computers in education can accomplish," McIntyre states.

In Lilly Toback's opinion, the fundamental misunderstanding that machine-specific or operating system-specific advocates make is a failure to see the educational virtues of different machines. Toback feels that the issue is familiarity with computers in general—not familiarity with a *specific* machine or operating system. "We're not breeding a generation of programmers," she observes. "Rather, we want our students to be knowledgeable users of computers. Certainly Commodore machines accomplish that goal. A student who learns to enter data on a Commodore can enter data on an IBM or a Wang. A student who does accounting on a Commodore can do accounting on a DEC machine."

Toby Koch is also aware that students will move from machine to machine not only in school but also after leaving school. She asserts that the dominant-operating-system approach to education represents "a primeval attitude. It's like saying the only language you need to learn is English because you're never going to leave your hometown."

Most students do eventually leave their hometowns, just as most of them eventually encounter more than one type of computer. Not all of those computers will be Commodore machines, but the foundation of computer expertise that is provided by 64s and 128s is, and will continue to be, one on which all students can build.

Computer Learning Month:

October 1987

October 1987 has been officially designated Computer Learning Month. A broad range of activities and events are planned to show the impact of personal computers on the educational process, both in and out of school. From contests to promotional literature and meetings, Computer Learning Month will make clear how far we've come and where we're headed in computer-aided education.

Not so long ago, the arrival of a school's first computer was cause for a day of celebration. Today, a whole month has been set aside to recognize the computer's impact on education.

October has been designated *Computer Learning Month*. Announced in the spring and officially commemorated by bills in both houses of Congress, Computer Learning Month is being organized and sponsored by the Software Publishers' Association (SPA), which is comprised of more than 25 hardware and software companies and computer publications (COMPUTE! Publications is a primary sponsor). Computer Learning Month will be marked by nationwide contests, exhibitions displaying computer-inspired children's activities, the sealing of a time capsule to be opened in the year 2001, and dozens of local events and "back to school" nights for parents.

Underlying and reinforcing all these activities will be a variety of promotional events and materials designed to heighten public awareness of the creative, productive, and educational benefits of computers.

For Parents Too

The events and materials are aimed at the full spectrum of nonbusiness computer use. "Our broad objective," states Cathy Carlston, vice president of educational market planning for Brøderbund, "is to expand the public's awareness of computers as valuable learning aids in the home and school. We hope to show parents, teachers, and children a wide range of educational applications and benefits."

The focus for the nonprofit campaign is by no means restricted to classroom use of computers. "We want to make people aware of how individuals have made computers part of their lives," Carlston says. "We'll be disseminating information on how computers are used in everyday learning at home as well as in school."

One important project is the development of "What Every Parent Should Know About Educational Computing," a booklet intended for free distribution. It will offer information on how parents can assist children with computers at home, and it will offer strategies and suggestions by which parents can become more involved with their children's schools.

A special Computer Learning Month poster will be distributed to museums, libraries, and schools across the country.

Contests

Computer Learning Month's sponsors have announced five contests addressing both teachers and students. The contest categories are, by grade, primary (grades K–5), middle (grades 6–9), and secondary (grades 10–12). Prizes for first- and second-place winners include computer systems and software libraries for both the entrant and his or her school.

1. *Computer Generated Student Art*: With separate categories for primary, middle, and secondary school students, this contest will judge student achievement in developing color or black-and-white art, generated solely through the use of a computer.
2. *Non-Computer Generated Student Art*: Entries can be art in any medium other than computer-generated. Media include, but are not limited to, sketches, collages, photo essays, and paintings. Artwork should incorporate the theme of computers, computer learning, or computer use.
3. *Student Essay*: Using computer-related opening sentences provided by SPA, students should produce an essay of 750 words or less.
4. *Teacher Lesson Idea*: Judges will evaluate submitted lesson plans of 1000 words or less, evaluating the teacher's effectiveness and innovation in using computers in the classroom.
5. *Group Projects*: Entries must be projects that involve four or more students and a teacher, and display a unique, effective approach to educational computer use. The entry must include a descriptive essay and documentation of the actual work accomplished.

Specific details and entry information for each contest are available from the SPA at the following address: Computer Learning Month, P.O. Box 19763, Washington, DC 20036-0763.

Contest entries will be judged by educators at the Making Schools More Productive Conference in Dallas, Texas, November 5–7. Student artwork will be eligible to become part of the nation's largest exhibition of student computer-related artwork. ©

SpeedScript 128

Robert Kodadek

The most popular program we've ever published is SpeedScript, *an easy-to-use and multifeatured word processor. Originally offered for the Commodore VIC-20 and 64 in the January 1984 issue of COMPUTE!'s Gazette,* SpeedScript *has generated national interest, and is one of the most widely used word processors for the Commodore 64. Here's a new version, written expressly for the Commodore 128 and an 80-column monitor. Most of the commands are the same as the 64 version, and some useful new features have been added.*

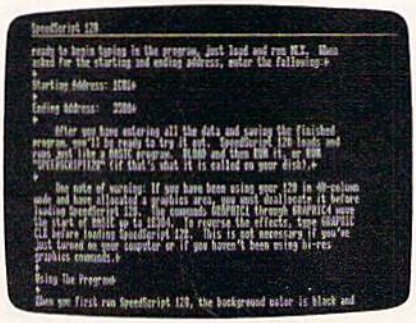
For many of us, there is one word processing program that stands out in the crowd. I'm speaking of *SpeedScript*, written by Charles Brannon and published in a variety of versions by COMPUTE! Publications. You would be hard pressed to find a program that functions as well or has even half as many valuable commands, with a price tag under a hundred dollars. *SpeedScript*, of course, was offered for the price of a magazine. Quite a bargain indeed.

Those of us who own Commodore 128s have longed for a *SpeedScript* version that would run in the machine's native mode. The *SpeedScript-80* program in the June 1986 issue, which ran in the 64 mode, was too much of a compromise, losing some valuable functions and speed of operation. *SpeedScript 128* is finally here and has more to offer than ever. The 64 version of *SpeedScript 3.2* has been rewritten specifically for 128 mode, with some interesting modifications, including full-screen formatting. The program is just over 6K in length.

Typing In *SpeedScript 128*

SpeedScript 128 is written entirely in machine language, so you must use the 128 version of "MLX," the machine language entry program found elsewhere in this issue, to type it in. When you are ready to begin typing in the program, just load and run MLX. When asked for the starting and ending address, enter the following:

Starting address: 1C01
Ending address: 3510



SpeedScript 128 *offers a full 80-column screen, plus many more features.*

After you've entered all the data and saved the finished program, you'll be ready to try it out. *SpeedScript 128* loads and runs just like a BASIC program. DLOAD and then RUN it, or just type RUN "SPEEDSCRIPT128" (if that's what it's called on your disk). Be sure the computer is in 80-column mode.

One note of warning: If you have been using your 128 in 40-column mode and have allocated a graphics area, you must deallocate it before loading *SpeedScript 128*. The commands GRAPHIC 1 through GRAPHIC 4 move the start of BASIC up to location 16384. To reverse the effects, type GRAPHIC CLR before loading *SpeedScript 128*. This, of course, is not necessary if you've just turned on your computer or if you haven't been using hi-res graphics commands.

Using The Program

Readers who have previously used *SpeedScript* on the 64 should read through the following list of changes that have been made. If you're not familiar with the way *SpeedScript* works, see the accompanying article ("*SpeedScript 128* Commands").

When you first run *SpeedScript 128*, the background color is black and the text color is white. A blue line separates the command line from the text below. The background color can be changed by pressing CONTROL-B, and the text color by pressing CONTROL-L. Once you have found the color combination most pleasing to your own taste, you can resave the program to preserve your selection. Your choice of screen line lengths may also be preserved in this manner.

In addition to the word-wrap feature in former versions of *SpeedScript*, the *128* version includes a command to set the desired width of the screen. After pressing CONTROL-W, enter a number between 10 and 79. The screen will automatically be reformatted to display that number of columns. The default value is 70, which is the right margin (75) less the left margin (5).

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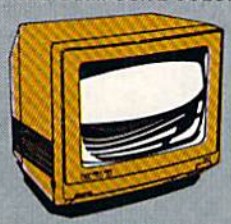

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When your print margins are set for the corresponding screen line length, your printed document will match the text display on your screen exactly. If you're using double- or triple-spacing, however, you may want to preview your document to see the page breaks. Use *SpeedScript*'s SHIFT–CONTROL-P command and select *S* for Screen. Use the NO SCROLL key to freeze the listing, or the RUN/STOP key to halt.

SpeedScript 128 uses all of bank 1 RAM for text storage. The main text area uses 51K, and the text buffer uses 12K. The program itself resides in bank 0 and uses special fetch and stash routines, located in common RAM, to cross banks and access the data. To check on the remaining amount of free text space at any time, press the CONTROL-= key combination. The number of bytes free is displayed on the command line.

The text buffer is no longer erased when choosing the Erase All Text command, giving this feature added versatility. Use the CONTROL-K command to erase or "kill" the buffer contents at any time.

Also corrected in this version is the bug in the Skip to Page command. In the earlier versions, this command would skip to the specified page, but along the way it would print every page number skipped, in the left margin of documents.

Using The Extended Keyboard

SpeedScript 128 has all the usual *SpeedScript* commands you're used to, but some of the command keys have changed. Prior versions of *SpeedScript* used the RUN/STOP key to insert five spaces into the text, but this caused minor difficulties because that key was also used to abort certain operations, such as printing. In *SpeedScript 128*, the TAB key has been programmed to support the insert-space function, thereby eliminating the conflict.

This modification necessitated changing the Insert mode command key to the ESC key instead of CONTROL-I. (CONTROL-I generates the same character code value as the TAB key.) Consequently, the CONTROL-I key combination will now also perform the tab function. The cursor, INST/DEL, and CAPS LOCK keys, as well as the numeric keypad, function as you would expect, although if you own a 128 with the original ROMs, the CAPS LOCK-Q bug will remain. (CAPS LOCK capitalizes all the letters of the alphabet except *Q*.)

SpeedScript 128 is a disk-based word processor, so the old tape routines are no longer present. Press F7 to load a file from disk, F8 to save a file. The CONTROL-4 key lists the disk directory. Use the NO SCROLL and RUN/STOP keys to control the listing. The disk error channel is read and reported at the command line after each disk operation.

Linking Files

SpeedScript 3.0 introduced a new printing command **g** (goto) to link text files, permitting the printing of very large documents. In the 64 version, the *g* must be followed by a *D* or *T* to select disk or tape, respectively. This command no longer works with tape drives. A new feature is that you can now access either device number 8 or 9 to chain files. Substitute the desired device number for the *D* in the command. For example, to link a file named TEXT from the disk in a drive with device number 9, you would press CONTROL-£ to select the format key, and then type **g9:text↵**. Be sure to enter a return mark as the last character of your filename. You may still use 16-character filenames as long as the return mark is the seventeenth character.

Speedy Access

Commodore has thoughtfully included some new ROM routines to access data from other RAM banks. However for a word processing application, these routines, INDFET, INDSTA, and INDCMP are far too slow, especially when moving large blocks of data. You can save about 50 percent of your time when you use the MMU chip's preconfiguration registers (PCRs) to directly configure memory. After storing the correct value in one of the PCR locations ($D501–$D504), any write operation to a corresponding load configuration register (LCR) will automatically switch banks. The LCRs are located at addresses $FF01–$FF04 and, unlike the PCR's, are visible to the processor even when the I/O block is switched out.

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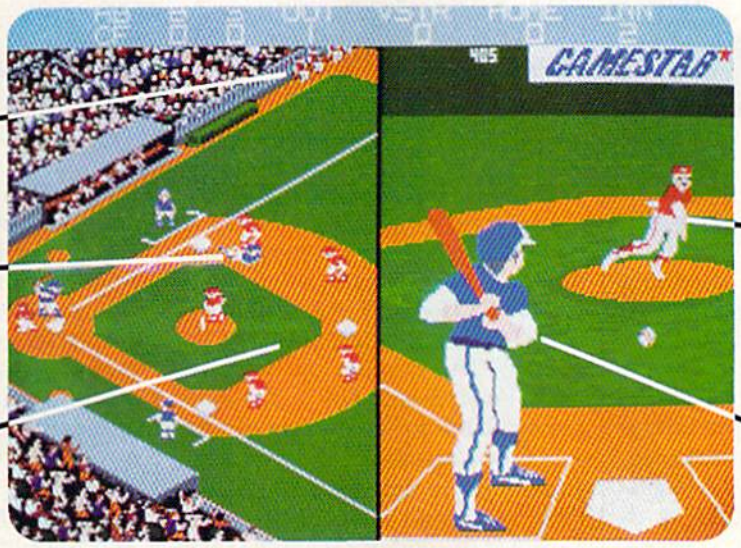

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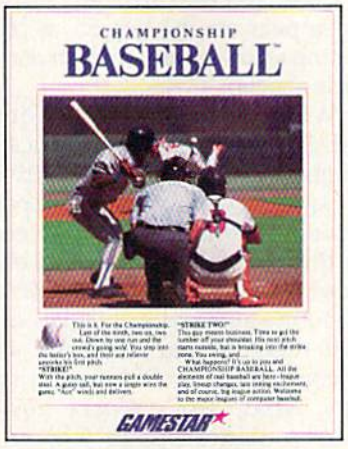

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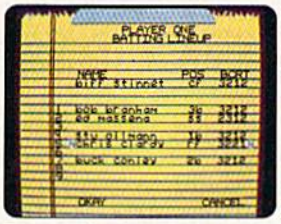

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SpeedScript 128 Commands

Although it's written entirely in machine language, you load and run *SpeedScript 128* as if it were a BASIC program. At the beginning of the program is a one-line SYS that sends the computer to the machine language program.

To begin using *SpeedScript 128*, just start typing. When the cursor reaches the right edge of the screen, it automatically jumps to the beginning of the next line, just as in BASIC. But unlike BASIC, *SpeedScript 128* never splits words at the right edge of the screen. If a word you're typing won't fit at the end of one line, it's instantly moved to the next line. This feature, called *word-wrap*, makes it much easier to read your text on the screen. Even if you make numerous editing changes, *SpeedScript 128* reformats the screen and rewraps all words.

The *command line* at the top of the screen is used to communicate with *SpeedScript 128*. All messages appear here. It's also the place where you enter filenames for loading or saving files. The remaining lines of the screen are used to enter, edit, and display your document. The *cursor* shows where the next character you type will appear on the screen. *SpeedScript* lets you move the cursor anywhere within your document, making it easy to find and correct errors.

Scrolling And Screen Formatting

When you finish typing on the last screen line, *SpeedScript 128* automatically scrolls the text upward to make room for a new line at the bottom. This is similar to the way BASIC works, but with one exception: The screen can scroll both up *and* down. Imagine the screen as a 24-line window on a long, continuous document.

More than 50K of text space is available in memory, room enough for roughly 40 pages of double-spaced text. To check at any time how much space is left, press **CONTROL-=** (hold down the CONTROL key while pressing the = key). The number on the command line indicates how many bytes are available for characters of text.

If you're used to a typewriter, you'll have to unlearn some habits. First, you don't have to press RETURN at the end of each line as you do on a typewriter. *SpeedScript 128*'s word-wrap takes care of this automatically. Press RETURN only when you want to force a carriage return to end a paragraph or to limit the length of a line. So that you can see these forced carriage returns, they appear on the screen as left-pointing arrows (called *return marks* in this article).

When you print your document, *SpeedScript 128* automatically formats your text to fit the width of the paper. Don't manually space over for a left margin or try to center a line yourself as you would on a typewriter. *SpeedScript 128*'s printing routine automatically takes care of all margins and centering and lets you customize the margin settings. Also, don't worry about where a printed page will end. When printing, *SpeedScript 128* automatically fits your text onto separate pages and can even put short phrases and page numbers at the top or bottom of each page if you want.

Like all good word processors, *SpeedScript 128* has a wide selection of editing and convenience features. You can move the cursor a single space in either direction, or skip to the next or previous word, sentence, or paragraph. You can also move the cursor to the top of the screen, the top of the document, or the end of the document. The INST/DEL key inserts a single space or deletes a single character. Other features let you erase a word, sentence, or paragraph, and move or copy sentences, words, and paragraphs to other places in your document. Using search-and-replace, you can find any phrase and even automatically change one phrase to another throughout the entire document.

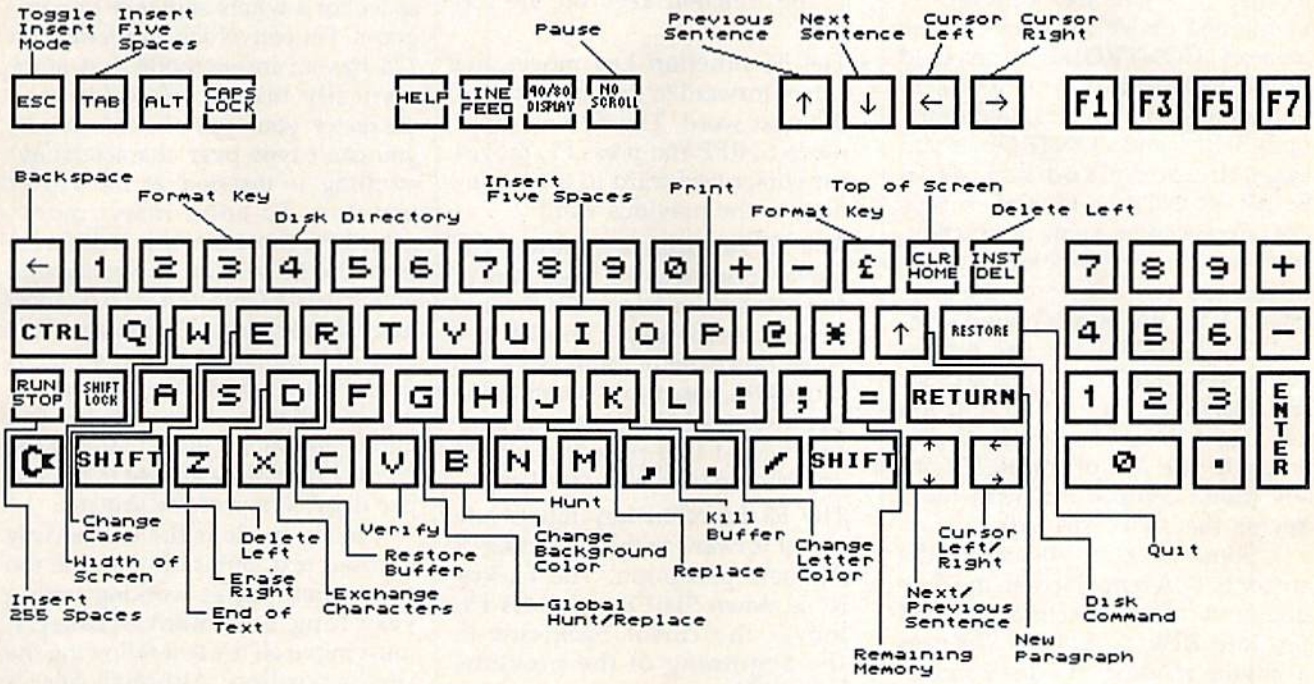
You can save your text on disk, and then load it later for additions and corrections. You can transpose (exchange) two characters, change the screen and text colors, send disk commands, read the disk error channel, and automatically tab over five spaces for paragraph indentions. You don't need to learn all these commands right away, but you'll be glad they're available as you become more comfortable with word processing.

Using The Keyboard

To start writing, just type on the keyboard. The words you type will be stored in memory and printed on the screen. Pressing a key puts the lowercase letter on the screen. If SHIFT, SHIFT LOCK, or CAPS LOCK is down, the character will appear in uppercase. The primary advantage of using CAPS LOCK is that the number keys on the top row print as numbers, not punctuation, although CAPS LOCK-Q will print a lowercase Q on 128s with the original ROMs. Holding down the Commodore key in the lower left corner and typing a character prints the corresponding graphics character. The SHIFT-key graphics characters cannot be typed in *SpeedScript*.

Most of *SpeedScript 128*'s commands are accessed with control-key commands—you hold down CONTROL while pressing another key. In this article, control-key com-

SpeedScript 128 Keyboard Map



Quick-Key Command

CONTROL-A	Change case
CONTROL-B	Change background colo
CONTROL-D	Delete (S,W,P) behind cursor
CONTROL-E	Erase (S,W,P) in front of cursor
CONTROL-G	Global search and replace
CONTROL-H	Hunt. With SHIFT: Select Hunt phrase
CONTROL-I	Insert five spaces
CONTROL-J	Replace. With SHIFT: Select Replace phrase
CONTROL-K	Kill buffer
CONTROL-L	Change text color
CONTROL-P	Print. With SHIFT: (Screen, Disk, or Printer)
CONTROL-R	Restore buffer
CONTROL-V	Verify
CONTROL-W	Select screen line length
CONTROL-X	Exchange two characters
CONTROL-Z	Go to end of text
CONTROL-=	Display free memory
CONTROL-↑	Send disk command/read error channel
CONTROL-4	Display disk directory
CONTROL-3	Enter format command
CONTROL-£	Enter format command
TAB	Insert five spaces
ESC	Toggle Insert Mode
Cursor Up	Previous sentence
Cursor Down	Next sentence
Cursor Left	Move left
Cursor Right	Move right
INST/DEL	Delete left. With SHIFT: Insert
CLR/HOME	Top of screen (press once); top of text (press twice)
SHIFT–CLR/HOME	Erase all text
←	Backspace. With CONTROL: Erase right. With SHIFT–CONTROL: Erase spaces
RESTORE	Exit to BASIC
RETURN	Return mark
SHIFT–RUN/STOP	Insert 255 spaces. With SHIFT: End paragraph

F1	Next word	F2	Previous word
F3	Next sentence	F4	Previous sentence
F5	Next paragraph	F6	Previous paragraph
F7	Load from disk	F8	Save to disk

mands are abbreviated **CONTROL-***x* (where *x* is the key you press in combination with CONTROL). An example is the **CONTROL-=** mentioned above to check on free memory. **CONTROL-E** means hold down CONTROL and press E. Sometimes you have to hold down both SHIFT and CONTROL as you type the command key, as in SHIFT–CONTROL-H. Other keys are referenced by name or function, such as ← for the left-pointing arrow in the top left corner of the keyboard, £ for the British pound symbol, CLR/HOME for the home-cursor key, SHIFT–CLR/HOME for the clear-screen key, F1 for function key 1, and ↑ for the upward-pointing arrow to the left of the RESTORE key (don't confuse this with the ↑ key on the cursor keypad).

Some keys let you move the cursor to different places in the document to make corrections or scroll text into view. *SpeedScript 128* uses a unique method of cursor movement that is related to writing, not programming. Programmers work with lines of text and need to move the cursor up and down a line or left and right across a line. *SpeedScript 128*, however, is oriented for writers. You aren't working with lines of text, but with a continuous document.

Therefore, *SpeedScript 128* moves the cursor by character, word, sentence, or paragraph. A word is any sequence of characters preceded or followed by a space. A sentence is any sequence of characters ending with a period, exclamation point, question mark, or return mark. And a paragraph is defined as any sequence of characters ending in a return mark. (Again, a return mark appears on the screen as a left-pointing arrow.)

Here's how to control the cursor:

- The **left/right-cursor key** works as usual; pressing this key by itself moves the cursor right (forward) one space, and pressing it with SHIFT moves the cursor left (backward) one space. You may also use the gray cursor keys to the left of the function keys on the top row.
- The **up/down-cursor key** moves the cursor forward to the beginning of the next sentence. Pressing it with SHIFT moves the cursor backward to the beginning of the previous sentence. You may also use the gray cursor keys to the left of the function keys on the top row.
- The **F1 function key** moves the cursor forward to the beginning of the next word. The **F2 key** (hold down SHIFT and press F1) moves the cursor backward to the beginning of the previous word.
- The **F3 function key** moves the cursor forward to the beginning of the next sentence (just like the up/down-cursor key). The **F4 key** (hold down SHIFT and press F3) moves the cursor backward to the beginning of the previous sentence (just like pressing SHIFT and the up/down-cursor key).
- The **F5 function key** moves the cursor forward to the beginning of the next paragraph. The **F6 key** (hold down SHIFT and press F5) moves the cursor backward to the beginning of the previous paragraph.
- **CLR/HOME**, pressed once by itself, moves the cursor to the top of the screen without scrolling. Pressed twice, it moves the cursor to the beginning of the document.
- **CONTROL-Z** moves the cursor to the bottom of the document. Remember that *z* is the last letter in the alphabet, and CONTROL-Z puts the cursor on the last character in your document.

Correcting Your Typing

One strength of a word processor is that you need never have mistakes in your printed document. Since you type everything before you print it, you have plenty of opportunities to proofread and correct your work. The easiest way to correct something is just to type over it, but there are other ways, too.

Sometimes you'll have to insert characters to make a correction. Maybe you accidentally dropped a letter, typing *hngry* instead of *hungry*. When you change the length of a word, you need to push over everything to the right of the word to make room for the insertion. Use **SHIFT-INST/DEL** to open up a single space, just as in BASIC. Merely position the cursor at the point where you want to insert a space, and press SHIFT–INST/DEL.

Insert Modes

It can be tedious to use the SHIFT–INST/DEL keys to open up enough space for a whole sentence or paragraph. For convenience, *SpeedScript 128* has an insert mode that automatically inserts space for each character you type. In this mode, you can't type over characters; everything is inserted at the cursor position. To enter insert mode, press **ESC** (note that this is different from the 64 version of *SpeedScript*, which uses CONTROL-I). To cancel insert mode, press ESC again. This kind of command key, one which is used to turn something both on and off, is called a *toggle*. To let you know you're in insert mode, the words *Insert Mode* appear in the upper right corner of the screen.

Insert mode is the easiest way to insert text, but it can become too slow when you're working with a very long document because it must move *all* the text following the cursor position. Although *SpeedScript 128* uses fast memory-move routines, the 8502 microprocessor can go only so fast. So *SpeedScript 128* has even more ways to insert blocks of text.

One way is to use the **TAB** key. It is programmed in *SpeedScript 128* to act as a five-space margin indention. It can also insert five spaces anywhere in a line. To end one paragraph and start another, press RETURN twice and press TAB. Alternately, you can press **SHIFT-RETURN**, which does this automatically. You can use TAB to open up more space than SHIFT–INST/DEL. No matter how much space you want to insert, each insertion takes the same amount of time, so the TAB key inserts five spaces, five times faster than pressing SHIFT–INST/DEL five times.

There's an even better way, though. Press **SHIFT-RUN/STOP** to insert 255 spaces. This is enough room for a sentence or two. You can press it several times to open up as much space as you need. And SHIFT–RUN/STOP is *fast*. (You don't want to be in insert mode when you use this trick; that would defeat its purpose.)

After you're finished inserting with these methods, there will probably be some inserted spaces left over that you didn't use. Just press **SHIFT-CONTROL-←**. (The ←

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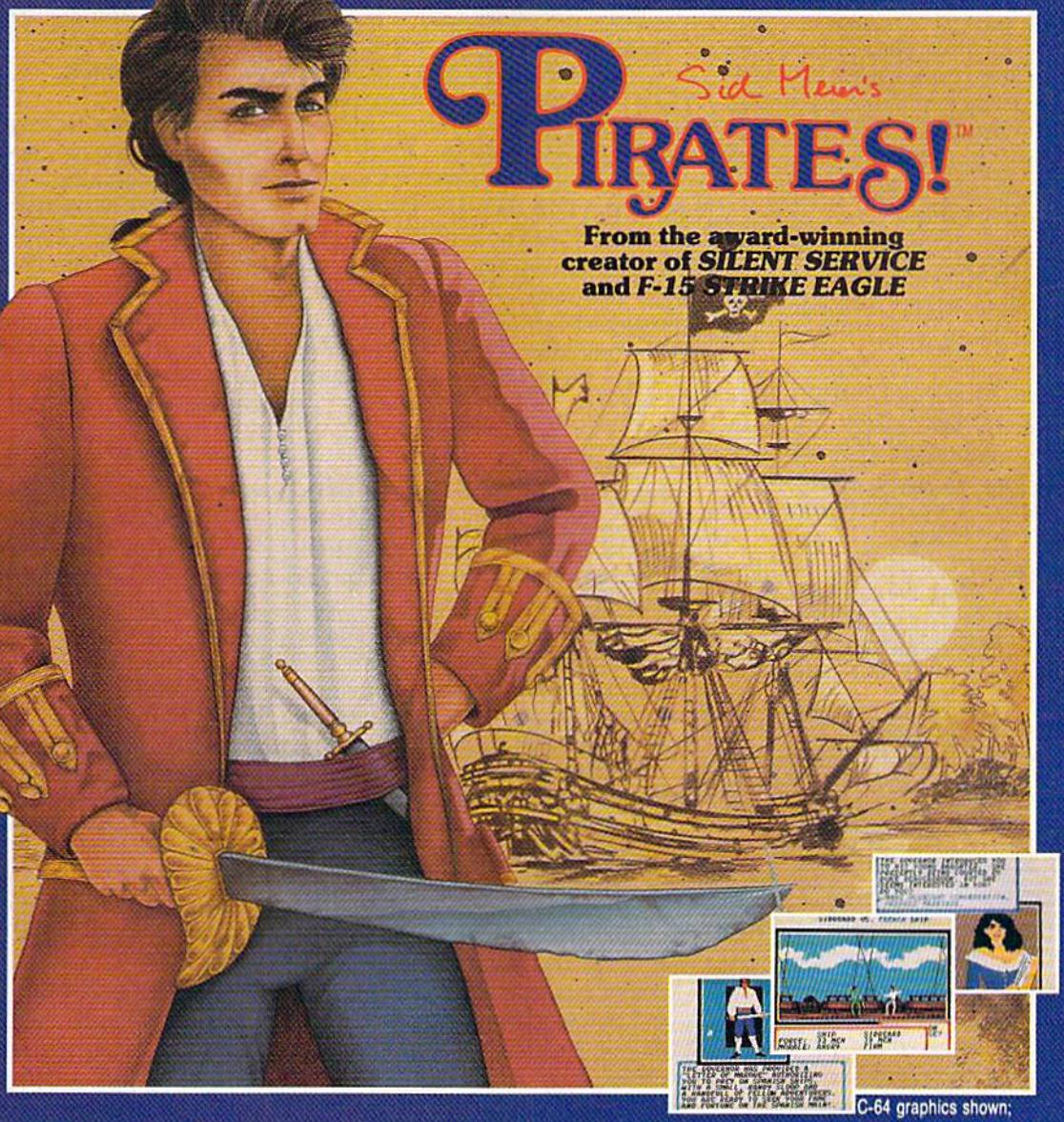

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is the key to the left of the 1 key, not the ← key in the cursor keypad.) This instantly deletes all extra spaces between the cursor and the start of the following text. SHIFT–CONTROL–← is also generally useful whenever you want to delete a lot of spaces.

Erasing Text

Inserting and retyping are not the only kinds of corrections you'll need to make. Part of writing is separating the wheat from the chaff. On a typewriter, you pull out the paper and throw it away. *SpeedScript 128* lets you be more selective.

Press the **INST/DEL** key by itself to erase the character to the left of the cursor. All the following text is pulled back to fill the vacant space.

Since the INST/DEL key is slow when you're working with large documents (it, too, must move all text following the cursor), you may prefer to use the ← (back-arrow) key to backspace. (Again, ← is the key to the left of the 1 key, not the ← key in the cursor keypad.) The ← key by itself moves the cursor left one space and blanks out that position. It's more like a backspace than a delete.

Press **CONTROL-←** to delete the character on which the cursor is sitting. Again, all the following text is moved toward the cursor to fill the empty space. INST/DEL erases to the left, keeping text on the right, while CONTROL-back arrow (←) erases to the right, preserving text to the left of the cursor.

These keys are fine for minor deletions, but it could take a long time to delete a whole paragraph this way. So *SpeedScript 128* has two commands that can delete an entire word, sentence, or paragraph at a time. **CONTROL-E** erases text *after* (to the right of) the cursor position, and **CONTROL-D** deletes text *behind* (to the left of) the cursor.

To use the **CONTROL-E** (erase) mode, first place the cursor at the beginning of the word, sentence, or paragraph you want to erase. Then press CONTROL-E. The command line shows the message Erase (S,W,P): RETURN to Exit. Press S to erase a sentence, W for a word, or P for a paragraph. Each time you press one of these letters, the text is quickly erased. You can keep pressing S, W, or P until you've erased all the text you wish. Then press RETURN to exit the erase mode.

The **CONTROL-D** (delete) mode works similarly, but deletes only one word, sentence, or paragraph at a time. First, place the cursor after the word, sentence, or paragraph you want to delete. Then press CONTROL-D. Next, press S, W, or P for sentence, word, or paragraph. The text is immediately deleted and you return to editing. You don't need to press RETURN to exit the CONTROL-D mode unless you pressed this key by mistake. *(In general, you can escape from any command in* SpeedScript 128 *by simply pressing RETURN.)* CONTROL-D is most convenient when the cursor is already past what you've been typing.

The Text Buffer

When you erase or delete with CONTROL-E and CONTROL-D, the text isn't lost forever. *SpeedScript 128* remembers what you've removed by storing deletions in a separate area of memory called a *buffer*. The buffer is a fail-safe device. If you erase too much or change your mind, just press **CONTROL-R** to restore the deletion.

Another, more powerful use of this buffer is to move or copy sections of text. To move some text from one location in your document to another, first erase or delete it with CONTROL-E or CONTROL-D. Then move the cursor to where you want the text to appear and press **CONTROL-R.** CONTROL-R instantly inserts the contents of the buffer at the cursor position. If you want to copy some text from one part of your document to another, just erase or delete it with CONTROL-E or CONTROL-D, restore it at the original position with CONTROL-R, and then move the cursor elsewhere and press CONTROL-R to restore it again. You can retrieve the buffer with CONTROL-R as many times as you like.

You can see why CONTROL-D lets you delete only a single sentence, word, or paragraph at a time. If it didn't, the deleted text would be added to the end of the buffer, and when you pressed CONTROL-R to retrieve the buffer, the deleted text would be out of order (since CONTROL-D deletes backward).

If you ever need to erase the contents of the buffer, press **CONTROL-K** (remember *kill buffer*).

It's relatively easy to move blocks of text between documents. Using the buffer, you can load one document, erase some text into the buffer, load another document, and then insert the buffer contents into the new document.

Starting From Scratch

If you want to start a new document or simply obliterate all your text, press **SHIFT-CLR/HOME**. *SpeedScript 128* asks, *ERASE ALL TEXT: Are you sure? (Y/N).* This is your last chance. If you *don't* want to erase the entire document, press N or any other key. Press Y to perform the irreversible deed. There is no way to recover text wiped out with Erase All.

The RUN/STOP–RESTORE reset combination has been disabled in *SpeedScript 128*. Pressing just RESTORE brings up the message *Exit SpeedScript 128: Are you sure? (Y/N).* If you press Y for yes, you exit to BASIC. (If you press N or any other key at the prompt, you return to editing text with no harm done.) Once in BASIC, you'll still have one chance to reenter *SpeedScript 128* without losing your text—simply enter RUN and your text should be intact when *SpeedScript 128* is restarted. (Your chances of recovering text decrease if you execute other commands—especially if you use variables—while in BASIC.)

Search-And-Replace

Here's another feature only a computer can bring to writing. *SpeedScript 128* has a Hunt command that searches through your document to find a selected word or phrase. A Replace option lets you automatically change one word to another throughout the document.

SHIFT-CONTROL-H activates the Hunt feature, **SHIFT-CONTROL-J** (J is used because it's next to the H) lets you selectively hunt and replace, and **CONTROL-G** (Global) is for automatically searching and replacing.

Searching for something is a two-step process. First, you need to tell *SpeedScript 128* what to search for; then you must trigger the actual search. Press SHIFT–CONTROL-

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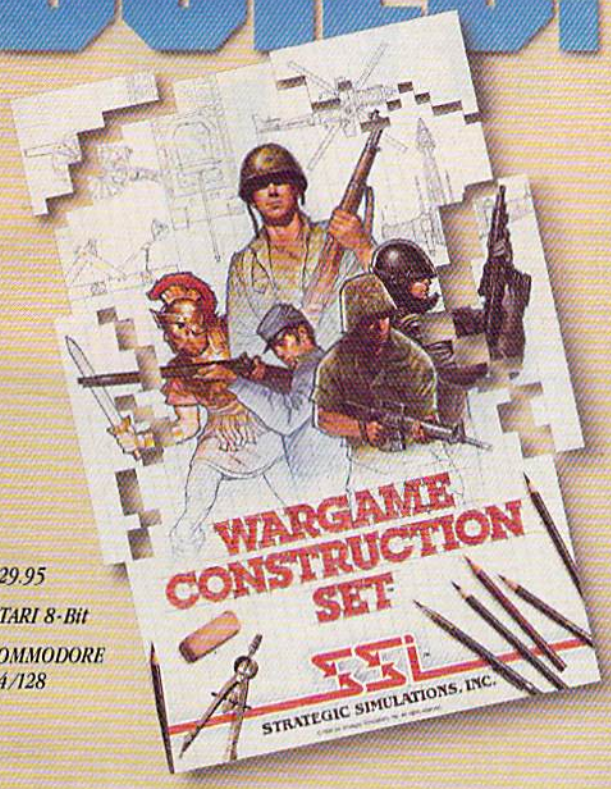

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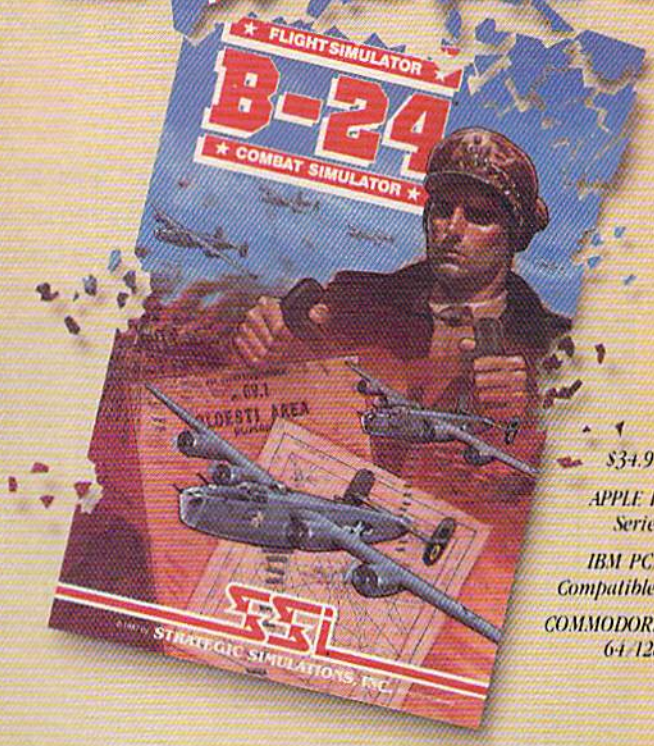

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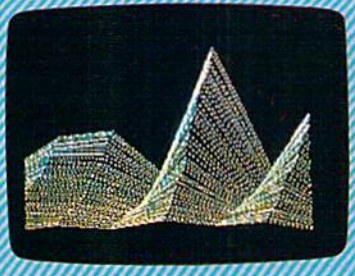

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H. The command line says *Hunt for:*. Type in what you'd like to search for (the *search phrase*) up to 29 characters. *SpeedScript 128* remembers the search phrase until you change it. (Incidentally, when you're typing on the command line, the only editing key that works is INST/DEL for backing up. *SpeedScript 128* does not let you enter control codes or cursor controls on the command line.) Press RETURN after you've entered the search phrase. If you press RETURN alone, without typing anything, the Hunt command is canceled.

When you're ready to search, press **CONTROL-H** without the SHIFT. *SpeedScript 128* looks for the next occurrence of the search phrase *starting from the current cursor position.* If you want to hunt through the entire document, press CLR/HOME twice to move the cursor to the very top before beginning the search. Each time you press CONTROL-H, *SpeedScript 128* looks for the next occurrence of the search phrase and places the cursor at the start of the phrase. If the search fails (if the search phrase isn't found before the end of the document), you'll see the message *Not Found.*

CONTROL-J (Replace) works together with CONTROL-H. After you've specified the search phrase with SHIFT–CONTROL-H, press SHIFT–CONTROL-J to select the replace phrase. *SpeedScript 128* also remembers this replace phrase until you change it. You can press RETURN alone at the *Replace with:* prompt to select a *null* replace phrase. When you hunt and replace, this deletes the located phrase. To search and replace manually, start by pressing CONTROL-H. After *SpeedScript 128* has found the search phrase, press CONTROL-J (without SHIFT) if you want to replace the phrase. If you don't want to replace the phrase, don't press CONTROL-J. You are not in a special search-and-replace mode. You're free to continue writing at any time.

CONTROL-G links CONTROL-H and CONTROL-J together. It first asks *Hunt for:*, then *Replace with:*, and then automatically searches and replaces throughout the document starting at the cursor position.

A few hints and cautions: First, realize that if you use *the* as the search phrase, *SpeedScript 128* dutifully finds the embedded *the* in words like *therefore* and *heathen.* If you changed all occurrences of *the* to *cow,* these words would become *cowrefore* and *heacown.* If you want to find or replace a single word, include a space as the first character of the word, since almost all words are preceded by a space. Naturally, if you are replacing, you need to include the space in the replace phrase, too. Also, *SpeedScript 128* distinguishes between uppercase and lowercase. The word *Meldids* does not match with *meldids. SpeedScript 128* will not find a capitalized word unless you capitalize it in the search phrase. To cover all bases, you will sometimes need to make two passes when replacing a word. Keep these things in mind when using CONTROL-G since you don't have a chance to stop an out-of-control search-and-replace.

Storing Your Document

Another advantage of word processing is that you can store your writing. A Commodore 1541–format disk with 170K of storage space can store 80–150 pages of text as several document files. The Commodore 1571 drive uses both sides of the disk, so it can store twice as much.

It's easy to store a document. First, make sure your disk drive is plugged in and functioning. Insert a formatted disk. Press the **F8** function key (SHIFT-F7). You'll see the prompt *Save:*. Type in a filename for your document. A filename can be up to 16 characters long and can include almost any characters, but do not use question marks or asterisks. You cannot use the same name for two different documents on a single disk. You can also precede the filename with either **0:** or **1:** if you use a dual disk drive. You can cancel the Save command by pressing RETURN without typing anything else at the *Save:* prompt.

Loading A Document

To recall a previously saved document, press the **F7** function key. Answer the *Load:* prompt with the filename. If you press F7 accidentally, press RETURN at the *Load:* prompt to cancel it.

It's important to position the cursor correctly before loading a file. *SpeedScript 128* starts loading at the cursor position, so be sure to press CLR/HOME twice or SHIFT–CLR/HOME (Erase All) to move the cursor to the start of text space, unless you want to merge two documents.

To merge two or more files, simply load the first file, press CONTROL-Z to move the cursor to the end of the document, and then load the file you want to merge. Do not place the cursor somewhere in the middle of your document before loading. A Load does not insert the characters coming in from disk into your old text; it overwrites all existing text after the cursor position. The last character loaded becomes the new end-of-text marker, and you cannot access any of your old text that may appear after this marker.

Disk Commands

Sometimes you forget the name of a file or need to scratch or rename a file. *SpeedScript 128* gives you full control over the disk drive. To view the disk directory, press **CONTROL-4**. The *4* key is used because it's the one with the dollar sign (think of it as LOAD"$",8). The directory is displayed on the screen without affecting the text in memory. Press any key to pause scrolling. Press RETURN to switch back to your text. All the other disk commands are also accessible: Just press **CONTROL-↑** (up arrow), then type in a standard Commodore disk command. You don't need to type PRINT#15 or any quotation marks as you do in BASIC—just the actual command. If you press RETURN without typing a disk command, *SpeedScript 128* displays the disk status. It also displays the status after completing a disk command. Here is a quick summary of disk commands:

n:*disk name,ID* This formats (NEWs) a disk. You must format a new disk before using it for the first time. The disk name can be up to 16 characters. The ID (identifier) is any two characters. You must use a unique ID for each disk you have. Don't forget that this command erases any existing data on a disk.

s:*filename* Scratches (deletes) a file from the disk.

r:*newname*=*oldname* Changes the name of file *oldname* to *newname*.

c:*backup filename*=*original name* Creates a new file (the backup copy) of an existing file (original copy) on the same disk.

i: Initializes a disk. This resets several disk variables and should be used after you swap disks or when you have trouble reading a disk.

v: Validates a disk. This recomputes the number of available blocks and can sometimes free up disk space. Always use Validate if you notice a filename on the directory flagged with an asterisk. Validate takes some time to finish.

uj: Resets the disk drive to power-up state.

u0>m0 Puts a 1571 disk drive in 1541 (single-sided) mode.

u0>m1 Puts a 1571 disk drive in 1571 (double-sided) mode.

Additional Features

SpeedScript 128 has a few commands that don't do much, but are still nice to have. **CONTROL-X** exchanges the character under the cursor with the character to the right of the cursor. Thus, you can fix transposition errors with a single keystroke. **CONTROL-A** changes the character under the cursor from uppercase to lowercase or vice versa. It has an auto-repeat feature; hold down CONTROL-A to continue changing the characters to the right.

Press **CONTROL-B** to change the background and border colors. Each time you press CONTROL-B, one of 16 different background colors appears. Press **CONTROL-L** to cycle between one of 16 character (lettering) colors. The colors are preserved until you change them. In fact, if you exit and resave *SpeedScript 128*, the program will load and run with your color choice in the future.

Printing

If you already think *SpeedScript 128* has plenty of commands, wait until you see what the printing package offers. *SpeedScript 128* supports an array of powerful formatting features. It automatically fits your text between left and right margins that you can specify. You can center a line, or block it against the right margin. *SpeedScript 128* skips over the perforation on continuous-form paper, or it can wait for you to insert single-sheet paper. A line of text can be printed at the top of each page (a *header)* and/or at the bottom of each page (a *footer),* and it can include automatic page numbering, starting with whatever number you like.

SpeedScript 128 can print on different lengths and widths of paper, and single-, double-, or triple-spacing (or any spacing, for that matter) is easy. You can print a document up to the size that can be held on a disk or tape by linking several files together during printing. You can print to the screen or to a sequential disk file instead of to a printer. Other features let you print to most printers, using most printer interfaces, and send special codes to the printer to control features like underlining, boldfacing, and double-width type (depending on the printer).

But with all this power comes the need to learn additional commands. Fortunately, *SpeedScript 128* sets most of these variables to a default state. If you don't change these settings, *SpeedScript 128* assumes a left margin of 5, a right-margin position of 75, no header or footer, single-spacing, and continuous-paper page feeding. To begin printing, simply press **CONTROL-P**. If your printer is attached, powered on, and selected (online), *SpeedScript 128* begins printing immediately. To cancel printing, hold down the **RUN/STOP** key until printing stops.

Before printing, be sure the paper in your printer is adjusted to top-of-form (move the paper perforation just above the printing element). CONTROL-P assumes a Commodore printer, so it's helpful if your interface simulates the modes and codes of Commodore printers. CONTROL-P prints with a device number of 4 and a secondary address of 7 (uppercase/lowercase mode).

If CONTROL-P doesn't work for you, try another variation, **SHIFT-CONTROL-P**. Answer the prompt *Print to: Screen, Disk, Printer?* with the single letter **S**, **D**, or **P**. Press any other key to cancel the command.

If you press P for printer, *SpeedScript 128* requests two more keystrokes. First, answer the *Device number* prompt with a number from 4 through 7. This lets you print to one of several printers addressed with different device numbers. Next, answer the *Secondary address* prompt with a number from 0 through 9.

Non-Commodore Printers

The secondary address is used on most non-Commodore printer interfaces to control special features. For example, you can bypass the emulation features and use graphics mode to communicate directly with your printer (see the true ASCII command below). Consult the list of secondary addresses in your printer interface manual. *SpeedScript 128* does not work properly with RS-232 serial printers or interfaces.

An additional note: Some printers and interfaces incorporate an automatic skip-over-perforation feature. The printer skips to the next page when it reaches the bottom of a page. Since *SpeedScript 128* already controls paper feeding, you need to turn off this automatic skip-over-perf feature (usually, by sending out control codes) before running *SpeedScript 128*, or paging won't work properly. Remember, sometimes the printer controls the skip-over-perf feature, sometimes the interface, and sometimes both.

The original Commodore 64 version of *SpeedScript* has been tested with the following printers: Commodore 1525 and 1526; MPS-801, -802, and -803; C. Itoh Prowriter 8510; Epson MX-80; Gemini 10-X; Star SG-10, SG-10C, and SD-10; Okimate 10 and 20; Okidata 82 and 92; and Hush-80 CD. *SpeedScript* has also been tested with these printer interfaces: Cardco A, B, G+, and G Wiz; Tymac Connection; Xetec; TurboPrint; and MW-350. *SpeedScript 128* should work even if your printer or interface is not on this list.

Be sure your printer or interface supplies its own linefeeds. Again, consult your manuals and insure that either your printer or interface (but not both) supplies an automatic linefeed after carriage return. To test this, print a small sample of text with CONTROL-P. Since the default is single-spacing, you should not see double-spacing, nor

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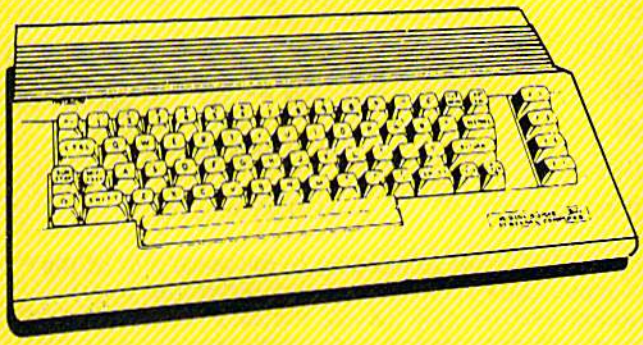

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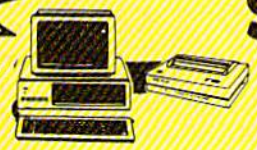

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should all printing appear on the same line. If you still aren't getting linefeeds, use the linefeed command discussed below.

Printing To Screen And Disk

SHIFT–CONTROL-P prints to the screen when you press S. What appears on the screen is exactly what would print on the printer. If you use double-spacing (see below), it's much easier to see how each line is printed. With this screen preview, you can see where lines and pages break. To freeze printing, press the No Scroll key. When printing is finished, press any key to return to editing.

SHIFT–CONTROL-P prints to a disk file when you press D. Enter the filename when it's requested. *SpeedScript 128* sends out all printer information to a sequential file. You can use other programs to process this formatted file. Try this simple example:

```
10 OPEN 1,4
20 OPEN 2,8,8,"filename"
30 GET#2,A$:SS = ST: PRINT#1,A$;: IF
   SS = 0 THEN 30
40 PRINT#1: CLOSE 1
50 CLOSE 2
```

This program dumps the disk file specified by the filename in line 20 to any printer. You can use it to print *SpeedScript 128* files (produced with SHIFT–CONTROL-P) on another Commodore computer and printer without running *SpeedScript 128*. Change line 10 to **OPEN 1,2,0, CHR$(6)** to dump the file to a 300-baud modem or RS-232 printer, or **OPEN 1,3** to display it on the screen.

Note that files that are saved (with F8) store text as screen codes. If you print to disk (with SHIFT–CONTROL-P), the characters are sent as Commodore ASCII. You may also print a file to disk as true ASCII by including the *a* formatting command at the beginning of the file. If you write messages or files you want to upload to a bulletin board or telecommunications service, the message should usually be stored as Commodore ASCII or true ASCII, depending on whether your terminal program is capable of translating between the two standards.

Formatting Commands

The print-formatting commands must be distinguished from normal text, so they appear onscreen in reverse field with the text and background colors switched. You enter these reverse-video letters by pressing **CONTROL-£** (British pound sign) or **CONTROL-3**, which is easier to type with one hand. Answer the prompt *Enter format key:* by pressing a single key. This key is inserted into text in reverse video. All lettered printer commands should be entered in lowercase (unshifted). During printing, *SpeedScript 128* treats these characters as printing commands.

There are two kinds of printing commands, which will be called stage 1 and stage 2. Stage 1 commands usually control variables such as left margin and right margin. Most are followed by a number, with no space between the command and the number. Stage 1 commands are executed before a line is printed.

Stage 2 commands, like centering and underlining, are executed while the line is being printed. Usually, stage 1 commands must be on a line of their own, although you can group several stage 1 commands together on a line. Stage 2 commands are by nature embedded within a line of text. A sample stage 1 line could look like this:

l10s50r2

Embedded stage 2 commands look like this:

cThis line is centered.←

This isuunderliningu.←

Stage 1 Commands

l Left margin. Follow with a number from 0 to 255. Use 0 for no margin. Defaults to 5. See Figure 2 for an illustration of margin settings.

r Right margin position, a number from 1 to 255. Defaults to 75. Be sure the right-margin value is greater than the left-margin value, or *SpeedScript 128* will become extremely confused. Some printer interfaces force a certain printing width, usually 80 characters wide. You'll need to disable this in order to permit *SpeedScript 128* to print lines longer than 80 characters.

t Top margin. The position at which the first line of text is printed, relative to the top of the page. Defaults to 5. The header (if any) is always printed on the first line of the page, before the first line of text.

b Bottom margin. The line at which printing stops before continuing to the next page. Standard 8½ × 11 inch paper has 66 lines on most printers (six vertical lines of text per inch is standard for Commodore printers). Bottom margin defaults to 58. The footer (if any) is always printed on the last line of the page, after the last line of text.

p Page length. Defaults to 66. If your printer does not print six lines per inch, multiply lines-per-inch by 11 to get the page length. European paper is usually longer than American paper—11⅝ or 12 inches. Try a page length of 69 or 72.

s Spacing. Defaults to single-spacing. Follow with a number from 1 to 255. Use 1 for single-spacing, 2 for double-spacing, and 3 for triple-spacing.

@ Start numbering *at* page number given. Page numbering normally starts with 1.

? Disables printing until selected page number is reached. For example, a value of 3 would start printing the third page of your document. Normally, *SpeedScript 128* starts printing with the first page. This option is useful if you've printed a long document and discover you need to correct a mistake and reprint a single page.

x Sets the page width, in columns (think *across*). Defaults to 80. You need to change this for the sake of the centering command if you're printing in double-width or condensed type, or if you're using a 40-column or wide-carriage printer.

n Forced paging. Normally, *SpeedScript 128* prints the footer and moves on to the next page only when it has finished a page, but you can force it to continue to the next page by issuing this command. It requires no numbers.

m Margin release. Disables the left margin for the next printed line. Remember that this executes before the line is printed.

a True ASCII. Every character is assigned a number in the ASCII (American Standard Code for Information Interchange) character set. Most printers use this true ASCII standard, but Commodore

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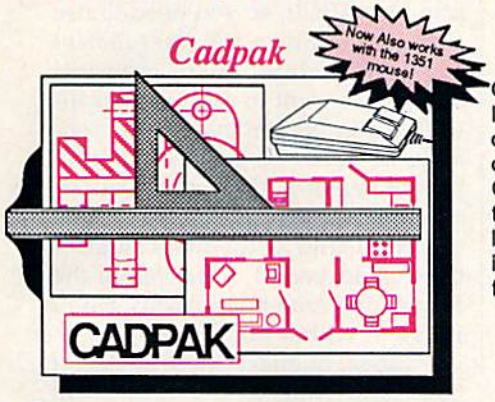

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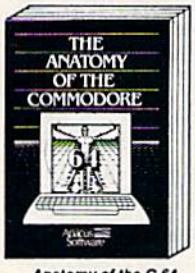

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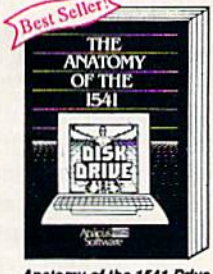

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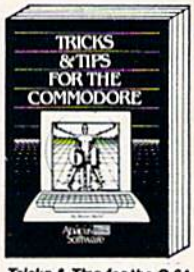

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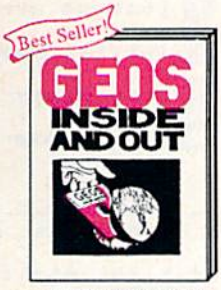

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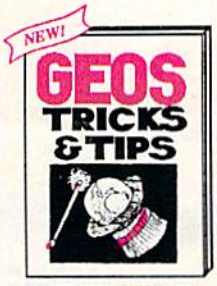

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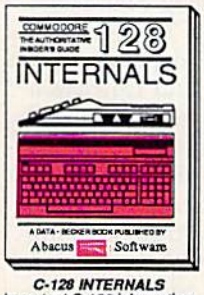

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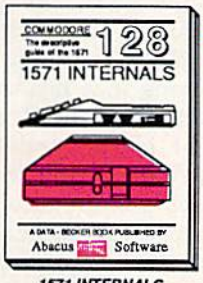

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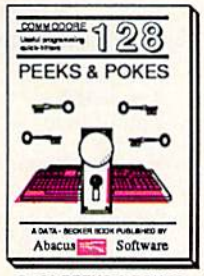

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Figure 2: Graphic Representation Of Margin Settings

Values shown are default settings

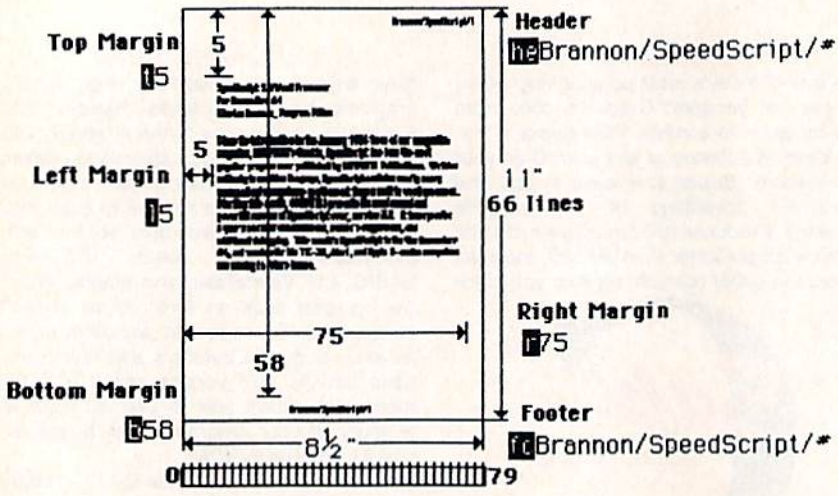

Figure 3: Quick-Reference Printer Format Commands

Command	Description	Default	Command	Description	Default
a	True ASCII	off	n	Next page	
b	Bottom margin	58	p	Page length	66
c	Centering		r	Right margin	75
e	Edge right		s	Spacing	1
f	Footer		t	Top margin	5
g	Link file*		u	Underline	
h	Header		w	Page wait	
i	Information		x	Columns across	80
j	Linefeeds on		@	Initial page #	1
l	Left margin	5	?	Skip pages	
m	Margin release		#	Print page #	

Examples:

```
hc SpeedScript/# ←     Centered Header with page number
l10r70s2 ←             Left margin 10, right margin 70,
                       double spacing.
g9:SpeedScript. ←      Goto and continue printing with
                       filename "SpeedScript."
* new format: gdrive#:filename
```

printers exchange the values for uppercase and lowercase to match Commodore's own variation of ASCII. Some printer interfaces do not translate Commodore ASCII into true ASCII, so you need to use this command to tell *SpeedScript 128* to translate. Also, you will sometimes want to disable your interface's emulation mode intentionally, in order to control special printer features that would otherwise be rejected by emulation. Place this command as the first character in your document, even before the header and footer definitions. Don't follow it with a number.

Since, in effect, the true ASCII command changes the case of all letters, you can type something in lowercase and use true ASCII to make it come out in uppercase.

w Page wait. Like the true ASCII command, this one should be placed at the beginning of your document before any text. With page wait turned on, *SpeedScript 128* prompts you to *Insert next sheet, press RETURN* when each page is finished printing. Insert the next sheet, line it up with the printhead, and then press RETURN to continue. Page wait is ignored during disk or screen output.

j Select automatic linefeeds after carriage return. Like **a** and **w**, this command must be placed before any text. Don't use this command to achieve double-spacing, but only if all text prints on the same line.

i Information. This works like REM in BASIC. You follow the command with a line of text, up to 255 characters, ending in a return mark. This line will be ignored during printing; it's handy for making notes to yourself such as the filename of the document.

h Header define and enable. The header must be a single line of text ending with a return mark (up to 254 characters). The header prints on the first line of each page. You can include stage 2 commands such as centering and page numbering in a header. You can use a header by itself without a footer. The header and footer should be defined at the top of your document, before any text. If you want to prevent the header from printing on the first page, put a return mark by itself at the top of your document before the header definition.

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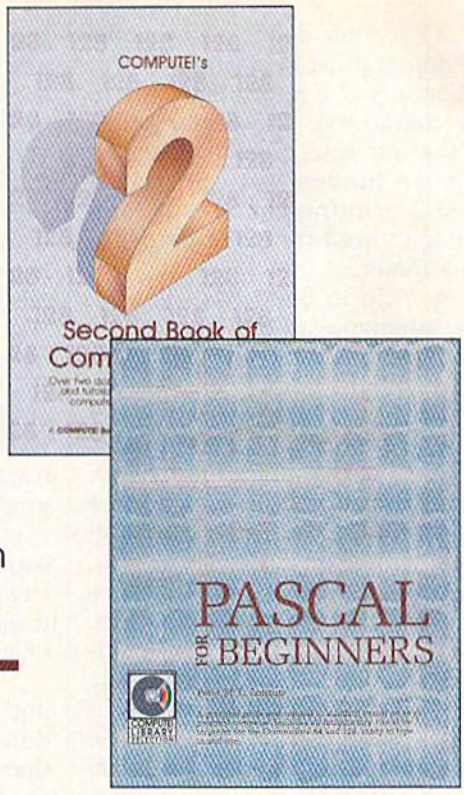

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f Footer define and enable. The footer must be a single line of text ending in a return mark (up to 254 characters). The footer prints on the last line of each page. As with the header, you can include stage 2 printing commands, and you don't need to set the header to use a footer.

g Go to (link) next file. Put this command as the last line in your document. Follow the command with the number 8 or 9 to select drive number 8 or 9, respectively, then a colon (:), and finally, the name of the FILE to print next. This is a change from Commodore 64 *SpeedScript*, where the *g* was followed with D or T, for disk or tape, respectively. The D and T options do not work in *SpeedScript* 128. (Most *SpeedScript* 128 disk commands assume that there is only one disk drive present, drive 8. If you do have two drives, only the link command can access files on drive 9.) After the text in memory is printed, the link command loads the next file into memory. You can continue linking in successive files, but don't include a link in the last file. Before you start printing a group of linked files, make sure the first of the linked files is in memory. When printing is finished, the last linked file will be in memory.

Stage 2 Commands

These commands either precede a line of text or are embedded within one.

c Centering. Put this at the beginning of a line you want to center. This will center only one line, ending in a return mark. Repeat this command at the beginning of every line you want centered. Centering uses the page-width setting (see above) to center the line properly. To center a double-width line, either set the page width to 40 or pad out the rest of the line with an equal number of spaces. If you use double width, remember that the spaces preceding the centered text will be double-wide spaces.

e Edge right. This command will cause a line to be aligned with the right margin when it is printed. That is, spaces will be inserted in front of the line so that the last character in the line will be printed at the right margin. Place the command at the beginning of the line you want aligned; it will only affect one line at a time, each ending with a return mark. Repeat this command at the beginning of every line you want aligned to the right. Note that this is *not* the same as *justification*—a feature found on some word processors that adjusts printing to align both the left and right margins. The edge-right command aligns only one line, and only at the right margin. *SpeedScript 128* has no right-justification feature. Attempts at right justification on printers without proportional spacing usually look sloppy, so this "feature" was omitted.

When *SpeedScript 128* encounters this command, it prints the current page number. You usually embed this within a header or footer.

u A simple form of underlining. It does not work on Commodore printers, but only on printers that recognize CHR$(8) as a backspace and CHR$(95) as an underline character. Underlining works on spaces, too. Use the first **u** to start underlining and another one to turn off underlining. If your printer has a built-in underlining feature, you'll probably get better results by defining a programmable printkey to use the printer's capabilities (see the details on printkeys below).

Fonts And Styles

Most dot-matrix printers are capable of more than just printing text at ten characters per inch. The Commodore MPS-801 can print in double width and reverse field. Some printers have several character sets, with italic and foreign language characters. Most can print in double width (40 characters per line), condensed (132 characters per line), and in either pica or elite. Other features include programmable characters, programmable tab stops, and graphics modes. Many word processors customize themselves to a particular printer, but *SpeedScript 128* was purposely designed not to be printer-specific. Instead, *SpeedScript 128* lets you define your own stage 2 printing commands.

You define a programmable *printkey* by choosing any character that is not already used for other printer commands. The entire uppercase alphabet is available for printkeys, and you can choose letters that are related to their function (like *D* for double width). You enter these commands like printer commands, by first pressing **CONTROL-£** or **CONTROL-3**.

To define a printkey, just press CONTROL-£ (or CONTROL-3), then the key you want to assign as the printkey, then an equal sign (=), and finally, the character code value to be substituted for the printkey during printing. For example, to define the + key as the letter *z*, you first look up the character code of the letter *z* in your user's manual. The Commodore character code for the letter *z* is 90, so the definition is

```
+ = 90←
```

Now, anywhere you want to print the letter *z*, substitute the printkey:

```
Gad+ooks! The +oo is +any!←
```

This will appear on paper as

```
Gadzooks! The zoo is zany!
```

More practically, look up the value of reverse-on and reverse-off. Reverse-on, a value of 18, causes all text to be printed in reverse until canceled by reverse-off (a value of 146) or a carriage return. So, define SHIFT-R as 18 and SHIFT-O as 146. Anywhere you want to print a word in reverse, bracket the word with printkey R and printkey O.

You can similarly define whatever codes your printer uses for features like double width or emphasized mode. For your convenience, four of the printkeys are predefined, though you can change them. Printkey 1 is defined as a 27, the value of the escape (ESC) code used to precede many two-character printer commands. (With some printer interfaces, you must send two escape codes in sequence to bypass the interface's emulation.) For example, the Epson command for double strike is ESC-G. You can select it in *SpeedScript 128* with

```
1G
```

Printkey 2 has a default value of 14, which puts most printers into double-width mode. Printkey 3 has a default value of 15, which turns off double width on some printers

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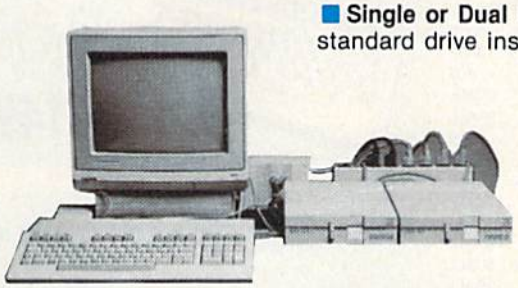

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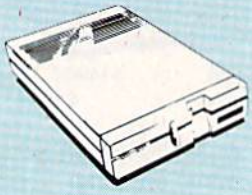

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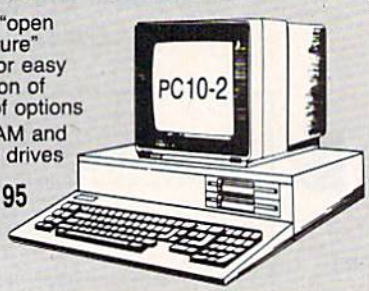

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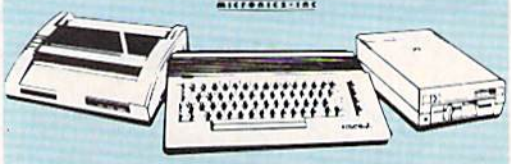

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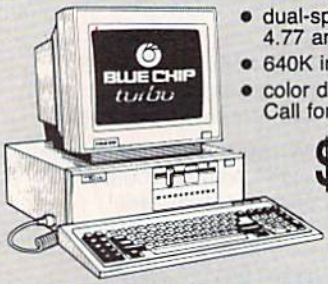

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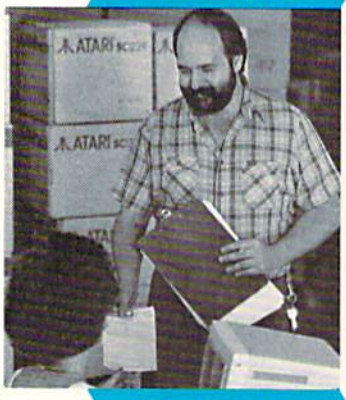

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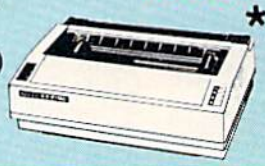

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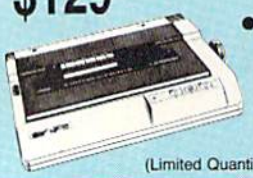

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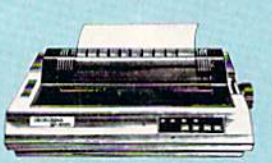

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and selects condensed mode on others. Printkey 4 is defined as 18, which selects reverse field with Commodore printers (and on some printer interfaces in emulation mode), or condensed mode on some other printers.

With so many codes available, you can even design custom logos and symbols using your printer's graphics mode. For example, on the 1525/MPS-801/MPS-803, you can draw a box (perhaps for a checklist) by first setting the appropriate codes:

```
1=8 2=25 3=255 4=193 ←
```

Then display the box with text by typing

```
1 3444432 Toothpaste ←
```

This appears on paper as

```
☐ Toothpaste
```

Keep one thing in mind about printkeys. *SpeedScript 128* always assumes it is printing to a rather dumb, featureless printer, the least common denominator. *SpeedScript 128* doesn't understand the intent of a printkey; it just sends its value out. So if you make one word within a line double width, it may make the line overflow the specified right margin. There's no way for *SpeedScript 128* to include built-in font and typestyle codes without being customized for a particular printer, since no set of codes is universal to all printers.

SpeedScript 128 Mastery

It may take you a while to fully master *SpeedScript 128*, but as you do, you'll discover many ways to use the editing and formatting commands. For example, there is a simple way to simulate tab stops, say, for a columnar table. Just type a period at every tab-stop position. Erase the line (CONTROL-E); then restore it (CONTROL-R) multiple times. When you're filling in the table, just use word-left/word-right to jump quickly between the periods. Or you can use the programmable printkeys to embed your printer's own commands for setting and jumping to tab stops.

SpeedScript 128 can also be used as a simple database manager. Type in the information you need, then store it as a *SpeedScript 128* document. The search feature lets you quickly find information, especially if you use graphics characters to flag key lines. You can search for the graphics characters and quickly skip from field to field.

You don't have to change or define printer commands every time you write. Just save these definitions as a small text file, and load this file each time you write. You can create many custom definition files and have them ready to use on disk. You can create customized "fill in the blank" letters. Just type the letter, and everywhere you'll need to insert something, substitute a graphics symbol. When you're ready to customize the letter, just hunt for each graphics symbol and insert the specific information.

File Compatibility

SpeedScript 128 documents are stored as program files (PRG type on disk). Naturally, you can't load and run a *SpeedScript 128* file from BASIC. The characters are stored in their screen code (POKE) equivalents.

Program 2 is a *SpeedScript 128* file-conversion utility. It translates *SpeedScript 128* screen-code program files into either Commodore character codes or true ASCII. These translated files are stored in sequential format, the file type used in most file-processing applications. The file converter can also translate a Commodore character-code sequential file into a screen-code *SpeedScript 128* program file. You can use the file converter to translate a database into a *SpeedScript 128* file (or vice versa), and you can convert *SpeedScript 128* files to true ASCII and use a terminal program to upload them to another computer.

See program listings on page 102.

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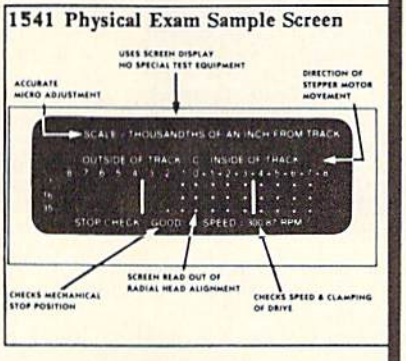
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See Reviews in: Run Special Issue #3, 1/87, p.83; Info #11, Aug/Sept 86, p.46 Midnite Gazette, April 1986, p. 19.

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Christopher R. Boss

Become the pilot of a helicopter, flying low over mountains, buildings, and trees, in this fast-paced simulation game. Levels are provided for pilots of all ages and skills.

"Chopper Pilot" is an exciting simulation game for the Commodore 64. It tests your abilities as a rescue-helicopter pilot. The test takes you over rugged terrain, cities, and light and telephone lines, as you attempt to touch flags with the helicopter skids to accumulate points. When you finish this flying test, you'll agree that it was not only difficult and challenging—it was a lot of fun.

Program Entry

Chopper Pilot is written entirely in machine language, but no knowledge of machine language programming is necessary to type it in. You must use "MLX," the machine language entry program found elsewhere in this issue, to enter it.

Here are the addresses you must enter at the first two MLX prompts:

Starting address: 0801
Ending address: 2290

After you've finished typing in the program with MLX, be sure to save it to disk or tape. You can load, run, or save Chopper Pilot like a normal BASIC program.

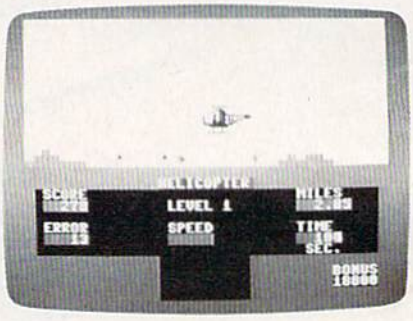
In Flight

To score points, you must fly as close to the ground as you can. The lower you fly, the more points you'll be awarded. But if you fly too low, you may hit the ground and lose points. In real life, just one error would stop you cold, but Chopper Pilot allows 25 errors per level.

There are 5 levels, each more difficult than the last. The terrain becomes increasingly craggy and mountainous as you progress from level to level.

When you fly, you must keep one eye on the jagged landscape and the other on your gauges and instruments. You must keep track of *time*, *miles*, and *errors*. If you run out of time, or if your score is too low when the course is completed, you cannot proceed to the next level. To be able to advance a level, your score must equal or exceed the *bonus* score displayed in the bottom right corner of the screen.

If you commit 25 errors, the test ends, even if you have time and miles remaining. A risky pilot won't get a high score because errors mount up quickly. When you commit 20 errors, the background color will change to yellow to serve as a warning.



Mountains, buildings, poles, trees, and flocks of birds provide the obstacles in this challenging test of helicopter-pilot skills. While flying, you must pay close attention to your instruments.

How To Fly Your Chopper

After loading the program, plug a joystick into port 2 and type RUN. You can change the chopper's window tint to reduce eyestrain and increase visibilty. Before you start a level, move the joystick to change the background color. You can choose clear (white), cyan, light green, or smoke (gray).

Press your firebutton to start the test.

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The joystick controls your altitude: If you pull back on the stick, the chopper goes up; push forward and the chopper goes down.

The fire button is your throttle: Holding it down will cause the chopper to accelerate; releasing it will slow the chopper down. If you don't touch the button for a few seconds, the chopper will simply hover in one place, wasting time and fuel.

The throttle is very important. Mountains and other obstacles loom up quickly, and the only way to avoid crashing into them is to slow down in time.

Extra-Point Flags

Black flags are set up at random in the valleys along the course. You'll

Normal flag, spun flag, and broken flag. Your score will improve if you spin the flags, but your errors will mount if you break them.

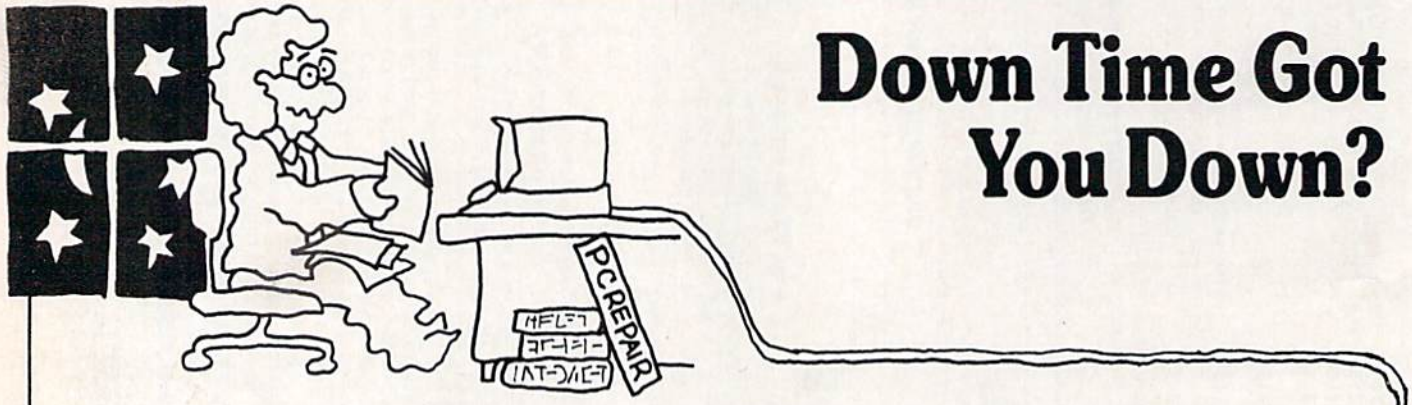
earn an extra 100 points if you spin a black flag around. To do so, your landing runners (or skids) must hit the flag—but be careful. If you're flying too low when you touch the flag, you'll break it and earn an error instead of a higher score. Unless you spin the flags around, you'll be unable to earn enough points to progress to the next level.

Hazards

Telephone poles and trees are the same height as the flags. If you're flying too fast, you may mistake a tree or telephone pole for a flag, and crash. Flocks of birds fill the skies above the valleys. If you don't fly very carefully, you may fly into a flock of birds, and crash while attempting to avoid a mountain.

Your skills as a pilot are going to be fully tested in Chopper Pilot. Remember to watch your instrument panel. It contains vital information that can help you develop a strategy for increasing your skill levels to become a better pilot.

See program listing on page 96.



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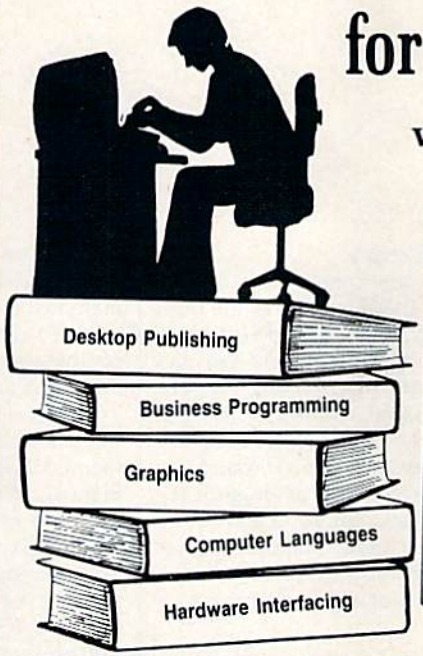

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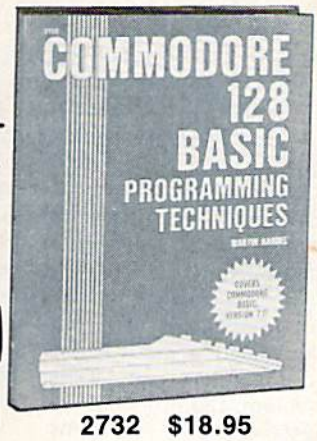

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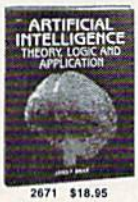

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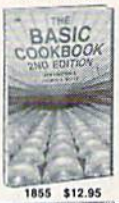

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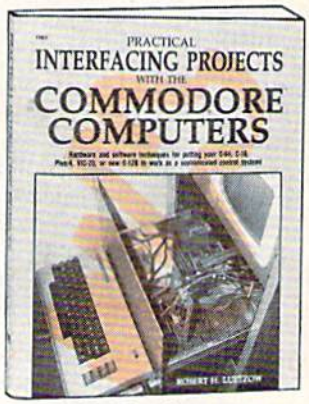

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Fleet System 4

The 1980s appear to be the decade for sequels. There was *Friday the 13th: Part V, Jaws III, Super Huey II,* and now there is *Fleet System 4* for the Commodore 128. The first thing I noticed about this software package was its attractive and practical book binders. After opening the case, I was pleasantly surprised to see two well-written and easy-to-follow spiral-bound instruction manuals. One manual is for *Fleet System 4*, a feature-packed word processing system; the other is for *Fleet Filer*, a database program. *Fleet System 4* comes with three disks: a program disk with a 90,000-word dictionary on one side, a thesaurus on the second disk, and *Fleet Filer* on the third.

Fleet System 4 can be loaded a couple of different ways. You can type DLOAD "FS and then type RUN, or you can simultaneously hold the RUN/STOP key and the SHIFT key to boot the program automatically. After the program loads, you are presented with an option for selecting 80 or 120 columns. Once you select either the 80- or 120-column mode, you are then ready to start entering text.

There are excellent built-in help screens to assist when needed. By pressing F1 and the V key, you access a menu of default settings that allows you to toggle multiple format settings, including the background color, character color, and cursor type. You can then save the parameters to the program disk, and, whenever you load *Fleet System*, the saved parameters will be loaded into the program. Format commands not listed on the default settings menu must be typed onscreen in front of the text. For instance, if you want to set your text for right justification, you simply press the Escape key, which places a Format Command Mark (checkmark) onscreen. Then type *ju1*. To turn it off, press the Esc key and type *ju0*. The F1 key is used more frequently than any other key in *Fleet System 4*. This key precedes many commands used to access different features within the program. F3 is used to insert text. F5 causes all text that is entered after depressing this key to be in all caps. F7 is the preview key, which lets you see the text exactly as it will be printed, without any visible control codes.

The program comes with a spell checker and a thesaurus. They are both extremely fast. I used the spell checker on a six-page document, and the dictionary checked it in 47 seconds. I spell-checked the same document using a ramdisk in only 12 seconds. A 90,000-word dictionary such as *Fleet System 4*'s can also spell-check an average document without encountering too many words it doesn't know. The thesaurus is an excellent feature—it gives you the option of selecting synonyms or antonyms.

The program comes with a spell checker and a thesaurus. They are both extremely fast. I used the spell checker on a six-page document, and the dictionary checked it in 47 seconds. I spell-checked the same document using a ramdisk in only 12 seconds.

Fleet System 4 comes with a good selection of printer files, but if the one you need is not listed, the program lets you create or modify a file so it will work with your printer.

A good feature of the directory listing is its ability to list a selective group of files. For instance, when you call up the directory, the status line gives you an option of selecting (U)ser files, (S)equential files, (P)rinter files, or (A)ll files on the disk. Therefore, if you wish to look at only printer files, simply press P; you then will see a complete listing of nothing but printer files. This feature keeps you from having to sift through all of the other files on the disk.

An extra text area is available whenever you need to perform various operations without interrupting the main text area. The main text area, when in 80-column mode, can accommodate approximately 600 lines of text. In the extra text area, it can handle an additional 40 lines. To switch from the main text area to the extra text area, just press F1 and the X key. This keypress combination will also return you to the main text area.

Fleet Filer, the database program that comes with *Fleet System 4*, is documented with a 39-page spiral-bound manual. While it is not a heavy-duty database program, it is extremely fast. The program and data are held in memory, thereby allowing calculations and sorts to be done almost instantly at multiple levels. Data from *Fleet Filer* can be integrated with *Fleet System 4*, and vice versa.

Fleet System 4 and *Fleet Filer* are two excellent programs that work well together. However, there are a couple of small changes I would like to see made in *Fleet System 4*. First, I'd like to see onscreen formatting when entering text. This would give you the ability to hyphenate words without having to enter the preview mode in order to determine which words should be hyphenated, and where. The second change would be to eliminate onscreen control codes and to design the program so that every command would be menu driven.

Overall, this is a very good word processing program that is powerful and easy to use. I really enjoy using the 90,000-word dictionary along with the thesaurus. After using this program and seeing all of its power and potential, I can hardly wait for *Fleet System 5*.

—Julius Hornbuckle

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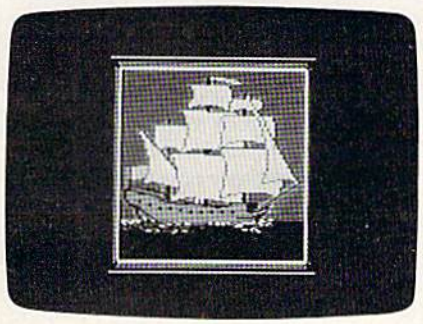
Pirates!

Ever pretend you were a pirate, fantasizing about the swashbuckling life on the Spanish Main? This exciting new package from Microprose gives you not only the opportunity to pretend that you're a pirate or a buccaneer, but also the chance to take part in a carefully assembled, historical simulation that recaptures an era and places you at its center.

Pirates! contains close to a century and a half of Caribbean history, offering different challenges and opportunities depending upon the time period. Players may select from time periods and scenarios ranging from the days of the Silver Empire (ca. 1560) when Spain was by far the dominant power in the region, to Pirate's Sunset (ca. 1680) when the frontier and colonial environment that supported the growth of piracy was being replaced by law and



civilization. You may select to be English, French, Dutch, or Spanish, with each nationality carrying its own set of inherent advantages and disadvantages.

During the pirate period, there rose to fame and glory any number of men whose names still hold magic today. Francis Drake, Piet Heyn, Henry Morgan, and others are represented in *Pirates!*. Players may elect to reenact one of their famous expeditions, including Drake's sack of the Silver Train and Henry Morgan's conquest of Panama.

You're not locked into recreating historical characters. A good introductory adventure places you in the position of a young Englishman indentured to a plantation owner. Indenture offers few prospects, while the open seas seem to hold limitless potential. You decide to become a buccaneer. First, though, you must prove your mettle. The men you will command ask questions about the location of Spanish wealth—questions that must be answered correctly from information contained in the program's excellent documentation, if you are to win their confidence. Correct answers alone are not enough; you must use your skill at fencing to defeat the captain of your vessel.

Whether in close-quarters combat with the enemy after boarding, or leading your men in an attempt to overthrow an unpopular captain, fencing is a skill both pirates and buccaneers must master. *Pirates!* gives you a choice of weapons—rapier, longsword, or cutlass—and puts you *en garde* against your opponent. Quick reflexes at the joystick let you parry and thrust your way to victory. Sluggish responses or a lack of aggression, though, can land you in the brig, where you must wait for months until the opportunity to command once more comes your way.

This exciting new package from Microprose gives you not only the opportunity to pretend that you're a pirate or a buccaneer, but also the chance to take part in a carefully assembled, historical simulation that recaptures an era and places you at its center.

Once you have achieved command, it's up to you to plan your expedition. Should you choose to go the pirate route, simply set sail and lie in wait for ships to plunder.

The life of a buccaneer is more complex. A visit with the local governor, selected from one of the program's menus, lets you know who England is at war with. Your charge as a buccaneer is to do damage to enemy fleets. After checking your stores, you set sail. *Pirates!* gives you a large, scrolling screen map of the Caribbean with virtually every island and city from Florida to Panama represented. As you sail from port-to-port, time passes, supplies dwindle, and your crew's supply goes up and down, depending on the number of successful encounters and amounts of plunder you acquire.

Navigation in *Pirates!* is well thought out and challenging, especially at higher difficulty levels. Both the documentation and a handsomely reproduced map included in the package give you the location of major islands and ports. Your own location can be determined by taking a sun sight, cleverly accomplished through the use of an on-screen astrolabe accessed through a menu. Even with your location and goals known, navigation is not simple. Strong winds can blow you off course, shoals can tear the bottom out of your hull, and lack of food or challenge can crush your men's morale.

At sea, your lookouts keep a close watch for other ships. When one is spotted, you may choose to investigate or sail away. Investigation reveals the type of ship and its nationality. Allied ships may be hailed for news; enemy or pirate vessels may be either attacked or avoided, depending upon your confidence in your ability to defeat them. The more closely you investigate, however, the more likely the other ship is to attack you, whatever your wishes.

Pirates! excels at its representation of combat on the high seas. You must use the winds to your best advantage, tacking for position while your men load and reload your cannon. Should you build a fleet of ships, a menu lets you select the vessel you wish to command in combat. Choose carefully—even the most skillful and courageous pirate will find it difficult to guide a barque against a more heavily armed frigate. It can be done, though.

During ship-to-ship combat, the bottom of the screen is set aside for information about your ship and your opponent's ship. The number of guns and men, damage levels, speed, and wind direction let you know how the battle is going. If the tide turns against you, you may try to sail away. If you have the upper hand, though, it's time to sail close to the enemy, toss the grappling hooks, and board.

Once you've boarded your opponent's ship, you must lead your men in combat. Again, it's time for your fencing skills to be tested. The courage and skill you show while dueling with the opposing captain has a direct effect on your men's spirits and their own fighting ability. During the duel, an information panel at the bottom of the screen keeps you posted on the number of men and their status. Weakness on your part can cause your men to panic, which in turn, can cost you your fleet and land you once more in the brig.

If you defeat the opposing captain, you must decide what to do with your prize vessel. With enough crew, you can add the ship to your fleet. If not, take what cargo and treasure you can carry, and then scuttle the ship and sail on to other encounters.

Not all of the adventures take place at sea. Ports-of-call play an important part in *Pirates!*. While anchored in ports controlled by your nationality or its allies, you may call local governors to seek instructions, and taverns are filled with hearty mates ready to sign on for a voyage. Merchants both buy and sell goods, stores, and supplies, and they'll purchase the goods you've plundered. While in port, you may wish to divide the spoils with your crew, in which case you should be aware that some of your men will disappear. You must reassem-

ble your band before you can set sail again.

Unfriendly ports offer opportunity as well. Brave captains can sneak into town to gather information and seize treasure, and with a large enough force, you can lay siege to a port or even mount an overland expedition to attack an inland community. As with its navigational and shipboard aspects, land combat in *Pirates!* is challenging, pitting your musketmen against a town's garrison, with the outcome determined by a swordfight. Once again your skill and courage are called upon to rally your men to victory.

As you play *Pirates!*, time passes within the scenario. Allegiances shift and wars break out between nations, both of which can affect your mission. The outbreak of the Thirty Years War, for example, breeds despair in Europe and opportunity in the New World. But the passage of time also has an effect on your performance—the life of a pirate, buccaneer, or privateer was never easy, and even the most successful of the breed eventually sought retirement.

The startup menus for *Pirates!* are easy to understand. In addition to selecting the scenario you wish to play, you are given a choice of skills, including fencing (highly recommended for first-time players), navigation, gunnery, and wit and charm (which can come in handy at advanced levels, where negotiation and trade are important).

The designers of *Pirates!* set themselves a variety of ambitious goals and succeeded on every count. Arcade aspects are exciting and challenging enough to keep even experienced players interested. The game makes large strategic demands on players, and miscalculations can bring a promising career to an end. Microprose has packaged *Pirates!* handsomely, with a thick manual that not only tells how to play the game, but also contains an impressive amount of historical material that both adds to performance and teaches history.

Pirates! is a real treasure.

—*Keith Ferrell*

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Russia

Over the past few years, I have reviewed many of SSG's games for COMPUTE! or COMPUTE!'s Gazette. I have enormous respect for Roger Keating and Ian Trout, the design team who are responsible for much of SSG's success. They are committed to their designs and their audience. SSG games, like the games of all the finest designers, bear the stamp of creative, distinctive personalities.

Russia—for the Commodore 64—is an army-corps level simulation of the Russo-German war of 1941–45, and my temptation once again is to call this one the best of the lot. Its topic is a perennial favorite among war gamers, its approach is a refinement of the excellent *Battlefront* system, and it is extremely playable and enjoyable. What more could I ask?

Its topic is a perennial favorite among war gamers, its approach is a refinement of the excellent Battlefront *system, and it is extremely playable and enjoyable.*

Well, nothing, as it turns out. But I'd to like to examine *Russia* from the point of view of those who won't find it interesting, and see if that colors things a bit. That way, I can ask—as I'm sure others are asking—if Keating and Trout aren't carrying a good idea a little too far. The "good idea" is the menu-driven game that gives the player a commander's point of view. The "little too far" is the fact that this is their fourth such consecutive game. First, to get the obvious out of the way, *Russia* is not an action game. It is a strategy and planning game, pure and simple. Those who want a war game along the lines of *Raid Over Moscow*, *Dambusters*, *F-15 Strike Eagle*, or *Silent Service* will find little arcade-style entertainment here. *Russia* is a war game of the SSI type, with hexagons and military symbols, lots of numbers and lots of historical flavor. That eliminates one gaming segment. But what of the fans of strategic war games? Could they find any flaws with *Russia*? The answer is yes.

Some might say that SSG—despite its commitment to "point-of-view"—takes too much control away from the player. In *Russia*, you set the doctrine for units, giving general orders about whether to rest or to advance towards and take a Soviet city. Then you set the support available for each corps, and whether or not that corps will advance, rest, defend, attack, or retreat.

What you can't do, though, is direct attacks or troop movement in specific directions. Once the front line is committed to battle, the commander can tell them to hit hard or back away but can't tell them which enemy units to hit or in which direction to retreat. Both targeting and the direction of unit movement are handled by the game's artificial intelligence routines.

Now this is both realistic and playable, and most war gamers will appreciate that *Russia* is attempting to simulate the degree of control the commanders actually had. But no matter how well the targeting routines and the movement routines reflect historical reality, I don't know of a single war gamer who wants to surrender that much control to a computer with only 64K of memory. Part of the enjoyment of historical war gaming is precisely the unrealistic amount of control the player has over his troops. Adjusting flanks, attacking unlikely places, changing orders every turn—all are part of war gaming even if they are not part of military command. Not having this control may teach us more about military operations, but it's also less fun.

In that sense, *Russia* is a prisoner of its own design. At least, that's one point of view. For many of us, though, the rest of the game more than compensates. Yes, it is frustrating to watch your corps attacking a hex that you don't particularly want them to attack, but that's what army group commanders in the eastern front had to put up with. At this level of command, once the commanding officer set overall objectives and assigned support, the actual battles were a waiting game, as *Russia* so clearly demonstrates.

Apart from this feature, admittedly a central one, I can't think of anything in *Russia* to object to. Like all SSG games, *Russia* is thoroughly professional, from its excellent tutorial to its inclusion of customized labels for saved game disks. SSG's direction is clear—to release a host of menu-driven, playable war games on topics ranging from the American Civil War to eighteenth-century musket warfare. Each game will be well researched and thought out, and each will be the game Keating and Trout think it should be.

—*Neil Randall*

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BobsTerm Pro For The 128

It takes time to master an application such as a terminal program or word processor. Most people settle on a single program in a given application category because it does what they want and they've memorized the important commands. It's rare to find someone who regularly uses five different word processors or eight different terminal programs.

Before starting to use *BobsTerm Pro*, I had my own favorite terminal program, which ran in 64 mode (40 columns), supported various transfer protocols, and had a reasonably large buffer for capturing text that could be printed out or saved to disk. I had looked at other terminal programs, but never switched loyalties because they didn't offer enough new features to justify learning a whole new set of commands.

But *BobsTerm Pro* is so powerful and has so many options that I've made the switch. It's easily one of the best terminal programs ever offered for a Commodore eight-bit computer.

BobsTerm Pro runs on a 128 in 128 mode and requires an 80-column monitor (either RGB or monochrome). It works with nearly all modems; the manual lists the Commodore 1650, 1660, 1670, Westridge, Master Modem, Mitey-Mo, HES I and II, Total Telecommunications, and Hayes-compatibles. I used an Aprotek, which is both Hayes- and 1670-compatible.

The program is not copy-protected, and the manual encourages users to make backups. It's best to use a program that duplicates an entire disk, rather than a file-by-file copier, to make sure you get the boot sector. Before running it, you must insert a dongle in joystick port 2 (you can make as many copies as you want, but they won't run without this little device). The program automatically runs when you reset the computer or type BOOT.

The first time you run *BobsTerm Pro*, you may have to set some parameters. Menus list the various options, including the type of modem, the baud rate, printer commands, how many disk drives are connected, and so on. It supports multiple drives—device 8, 9, 10, or 11—as well as dual drives such as the MSD, and one-megabyte drives such as the SFD. While you're setting the parameters, you may wish to define the function keys, too.

Once you've set the options to your liking, select the Save Parameters item from the menu. Whenever you boot the program in the future, the settings will automatically load, so you only have to set them once. Since you're allowed to make backups, you can make multiple boot disks with different parameters (one disk for the local Punter board, one for GEnie, one for CompuServe, and so on).

BobsTerm Pro supports Xmodem transfers, offering checksum and two CRC protocols. Since Xmodem is the universal standard for sending and receiving files, it's probably the most important feature to look for in a terminal program. If you're calling a large telecommunications service such as CompuServe, GEnie, or Delphi, you can adjust the timing to allow for the occasional delay during the busy hours.

You can transfer files to and from a disk file or the buffer. You can save files as sequential or by program type. You can also tell the program to translate between Commodore ASCII and true ASCII, which is useful for text files.

> BobsTerm Pro *is easily one of the best terminal programs ever offered for a Commodore eight-bit computer.*

Xmodem sometimes has problems handling IMG files from CompuServe because they have six extra bytes at the beginning of the file, for use by the CompuServe-B protocol. With *BobsTerm*, you can tell the program to ignore the first six bytes and avoid the problems of translating IMG files.

Most of the time, you're sending or receiving programs for 64 mode or 128 mode, so the default disk type is a Commodore format. But if you use CP/M mode, you can also download CP/M programs directly to CP/M formatted disks, which means you don't need a separate terminal program for CP/M mode, nor do you have to tinker around with translator programs that convert from one disk format to another.

Besides Xmodem, the other popular transfer protocol is Punter, which is a Commodore-specific standard for sending and receiving files. It's widely used on bulletin boards (BBS's) around the country. *BobsTerm Pro* supports Punter protocol.

It also handles XON/XOFF, straight ASCII transfers, and line-by-line prompted transfers, which are helpful when you're sending prewritten messages to BBS's or telecommunications services. Finally, there's a way to send a complete disk (all tracks and sectors) to someone else who is using *BobsTerm*. At 300 baud, this process takes about 2½ hours; at 1200 baud, 35 minutes.

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The capture buffer holds 60,000 bytes—more than enough room for most messages or programs. If 60,000 bytes is insufficient, *BobsTerm* has ways to split up large files. The buffer isn't a passive chunk of memory that you simply fill up or empty. *BobsTerm Pro* includes a wide variety of editing commands for inserting, deleting, replacing, converting, reformatting, and so on. The buffer editor isn't a complete word processor, but it's suitable for converting files into a format you like. The editor also allows you to mark a section of the buffer for selective uploading.

If you call a lot of BBS's, you probably keep a list of phone numbers and passwords. The phone book option allows you to store multiple numbers on disk, so you don't lose the numbers or mistype them when you dial. If a given number is busy, the program continues to dial the phone until a connection is made. You may also create macros using a mini-programming language. For example, you could wait for a given prompt (*User Number?*, for example), send a string, wait for another prompt (*Password?*), respond with another string, and so on. The commands include an if-then option, which lets you select one of two choices, depending on what characters are sent by the BBS or telecommunications service. If you have messages waiting, the macro could be programmed to open the buffer, read the electronic mail, and save it to disk. If not, it would skip that step.

Programmable macros are great ways to automate telecommunications. If you're paying for online time, you can save a lot of money by logging on, capturing messages, and leaving. You can then read the messages on your own time (when you're not paying connect charges or long-distance fees). You can also compose messages with a word processor and send them at faster rates (300 or 1200 baud) than you could ever hope to type.

The disadvantage of macros is that they're not completely secure. If someone looks at the files on your disk (or, worse, if you accidentally upload a macro file), other people could find out what your password is. Whenever you store a password on disk, you should be careful about who has access to it.

BobsTerm Pro has many other commands and modes. You can tell it to emulate an ADM-31, VT-52, or VT-100 terminal. You can define various cursor and control keys. You can send disk commands and look at Commodore or CP/M disk directories. You can set or clear either of two time-of-day clocks. You can even set it up as a mini-BBS with uploading and downloading.

The manual contains over 100 pages; it's well-written and clear in explaining how to use the program. But you needn't read the whole manual before running the program. For a feature-filled terminal program, *BobsTerm Pro* is remarkably easy to use. You can start telecommunicating in almost no time. At any point during an online session, you simply press the RUN/STOP key to open a window listing the available commands and options, which saves time you'd spend paging through the manual. When you return to terminal mode, the window closes, restoring the text underneath.

I can recommend *BobsTerm* [illegible] to anyone who spends a lot of time telecommunicating. If you own a 128 with an 80-column screen and a modem, this is a gem of a terminal program.

—Todd Heimarck

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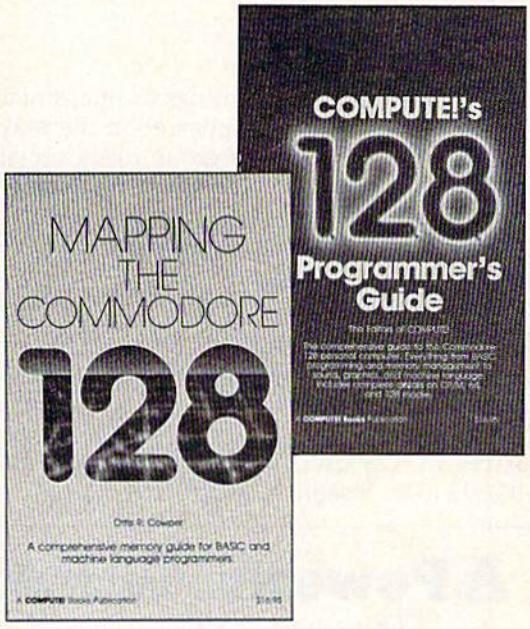

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User Group Update

Caroline D. Hanlon, Editorial Assistant

This list includes updated entries to our annual "Guide to Commodore User Groups," which last appeared in the May and June 1987 issues.

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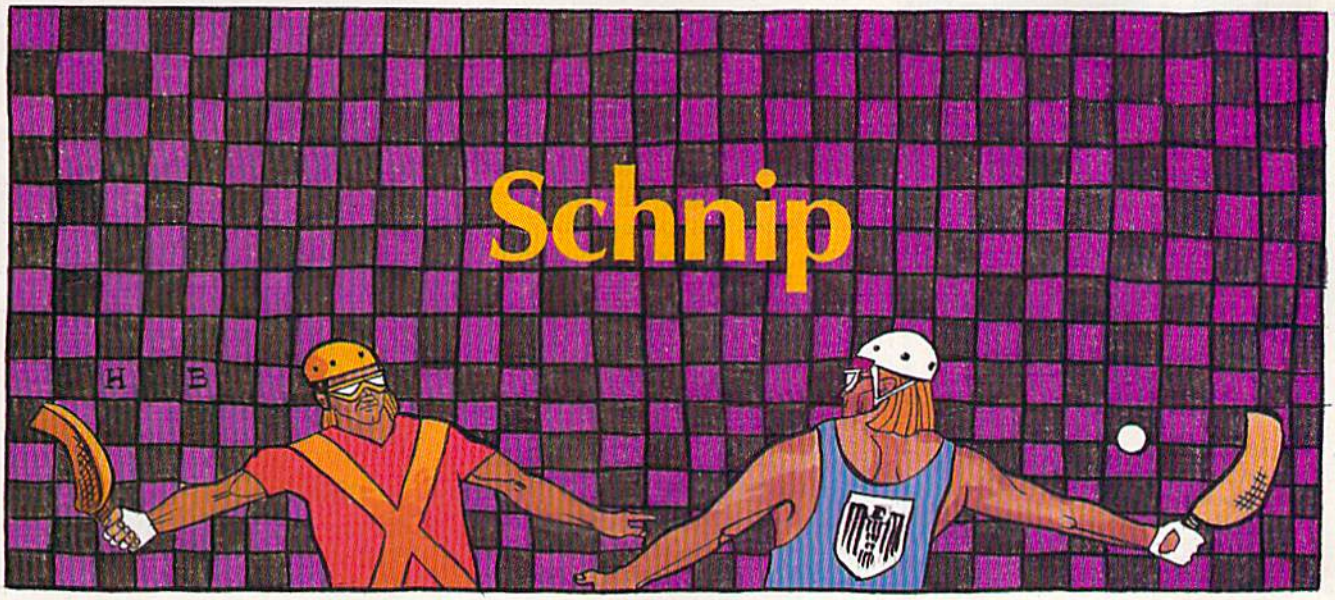

David Florance

This colorful and lively two-player game for the Commodore 64 will put your racquet skills to the test. It brings an ancient sport of kings into the computer age. Two joysticks are required.

When you and an opponent face off in a game of "Schnip," you aren't sitting down to just another computer game. Fast-moving and emblazoned with color that bespeaks the tradition of feudal times when chivalry was in full flower, Schnip is the modern replaying of a legendary match between kings. When King Garth and King Radern each laid claim to the Vaile, a lush arbor that lay between their kingdoms, they agreed to settle the impasse with a game of Schnip. The winner of the match would be the proprietor of the Vaile.

Typing It In

Schnip is a machine language game that features multicolor sprites and realistic sound. To type it in, you'll have to use the "MLX" machine language entry program found elsewhere in this issue. After you run MLX, you'll be prompted to enter the starting and ending addresses for the data. Enter these addresses:

Starting address: C000
Ending address: CAC7

Once you have typed it in, save a copy to disk or tape before leaving MLX. When you're ready to play, load Schnip by typing LOAD *"filename"*,8,1 (for disk) or LOAD *"filename"*,1,1 (for tape), where *filename* is the name you used when you saved the program. Then enter SYS 49152. You'll be asked to type in the players' names. Next, the playing screen will appear. You will see the court, the players' names and scores, a schnip, and two kings wielding racquets.

In this computer version of racquetball, quick thinking and lightning reflexes are the keys to successful play.

Playing Tournament Schnip

Schnip is played on an enclosed court with three walls and an endline. The ball—called a *schnip*—is hit *(volleyed)* off the walls. *Escapes* are awarded a player when the schnip crosses the endline. The winner is the player with the most escapes.

Each match is divided into rounds called *levels*. Every fifth escape, the level—and the schnip—is changed. Each of the five schnips has a different weight. Because of the difference in weight, the schnips travel at different speeds. Heavier schnips move quickly, while lighter ones tend to float. Once the fifth schnip is played, the schnips are recycled until the match is over. While the match is in fourth schnip (speed schnip—when the schnip is heaviest and fastest), it is more difficult to hold the volley. Until you've practiced many hours, the fourth schnip will be difficult. Even as you become an accomplished schnipper, you'll find the fourth schnip the most challenging.

To begin the match, player 2 (with the joystick plugged into port 1, the white king) should press the fire button. The schnip will be served to the white king (the white king always receives the first serve). The match starts when he returns

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the serve.

The schnip changes color after it is volleyed. It turns black after the white king volleys and is white following the black king's volley. The color indicates who controls the schnip. When the schnip escapes over the endline, a point is awarded to the player who does not control it. Thus, when you volley the schnip, try to send it out of court to gain an escape. Each escape is worth one point. Play continues until one of the kings scores a schniptive, or 21 points.

Advanced Schnipping

Schnip is a game of strategy as well as a game of skill. Returning serves and volleying the schnip are just the basics. There are several maneuvers to increase your chances of winning. The *fizzer*, *trap*, and *block* are tactics you can use to gain a quick schniptive.

The Fizzer

The *fizzer* is a powerful, surprising, and unpredictable ploy. To gain a fizzer, take your king to the *bridge* (the upper edge of the court) at the right, left, or center. Once there, volley the schnip repeatedly until it bounces over the wall of the court.

Your opponent will have difficulty judging where the schnip will reenter the court. Even if he guesses correctly, chances are he will send the volley directly back to you. If that happens, smash the schnip off one of the walls and gain an almost certain escape.

Usually your opponent will be unable to find the reentry point, and the schnip will escape the court unvolleyed.

The Trap

The *trap* is the most difficult advanced manuever because it entails two separate actions—catching the schnip and throwing it. Master the trap by practicing the moves one at a time. Once learned, its effects are devastating to an opponent.

To trap the schnip, move your king forward and point your racquet so the schnip gently grazes it. The schnip will fall into your raquet hand. Once you catch it, quickly lunge your king forward to throw the schnip. The schnip may be thrown by lunging your king either forward or backward after catching the schnip. The trap has the effect of transforming the schnip into a kind of boomerang so your opponent will have to guess where the schnip will reenter the court after it is thrown.

Again, this maneuver is very difficult to learn. If it seems you can't do it, just keep trying. Here's a helpful hint: The trap is most easily mastered with the first or fifth schnip—when the schnip is lightest and slowest. If you try to learn to trap during other levels, you will find it much more difficult. If you practice the trap at first and fifth schnip, you eventually will be able to gain it at other levels.

The Block

The *block* is the easiest and the most versatile of the advanced techniques. The block occurs when one king prevents the other from volleying the schnip by standing or running in front of him. The blocking king volleys twice or more in succession and prevents the other king from protecting his schnip.

The Fault

Schnip has only one penalty—the *fault*—which occurs when a king misses any serve. When a fault occurs, one or more of the following serves will have a reversed trajectory. The fault may be overcome by moving the king who committed the fault to the schnip and volleying it from there.

The fault can be a defensive or offensive maneuver. You may wish to create a fault by missing your serve purposely. You may catch your opponent unprepared for a reverse serve.

Create Your Own Moves

Experiment with the schnip. Try different ways of outwitting your opponent. Add to the tournament rules. For instance, you could declare the match to be the best of five schniptives. You may consider switching kings between matches to even the number of serves taken. Find ways to play the game that suit you best. At the end of a match, when a schniptive occurs, the kings have the option to reschnip. If you exit the game and then change your mind, simply enter SYS 49152 from BASIC to restart the game.

See program listing on page 93.

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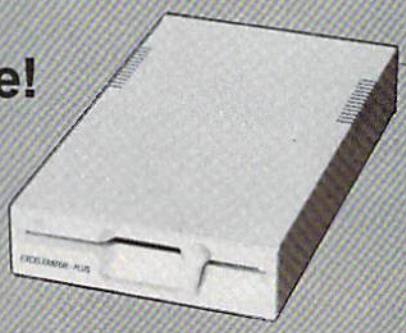

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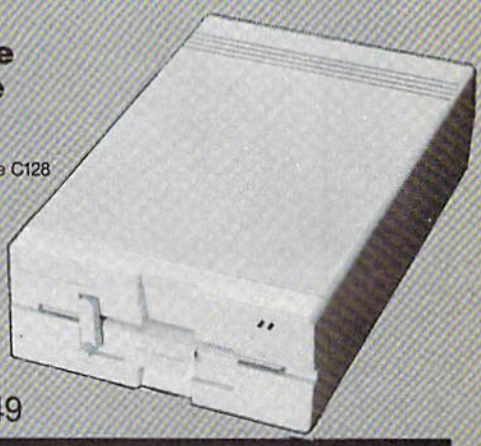

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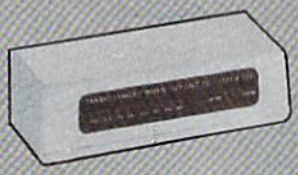

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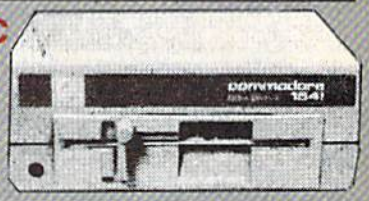

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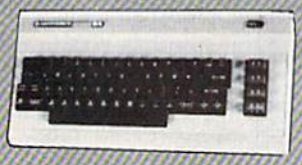

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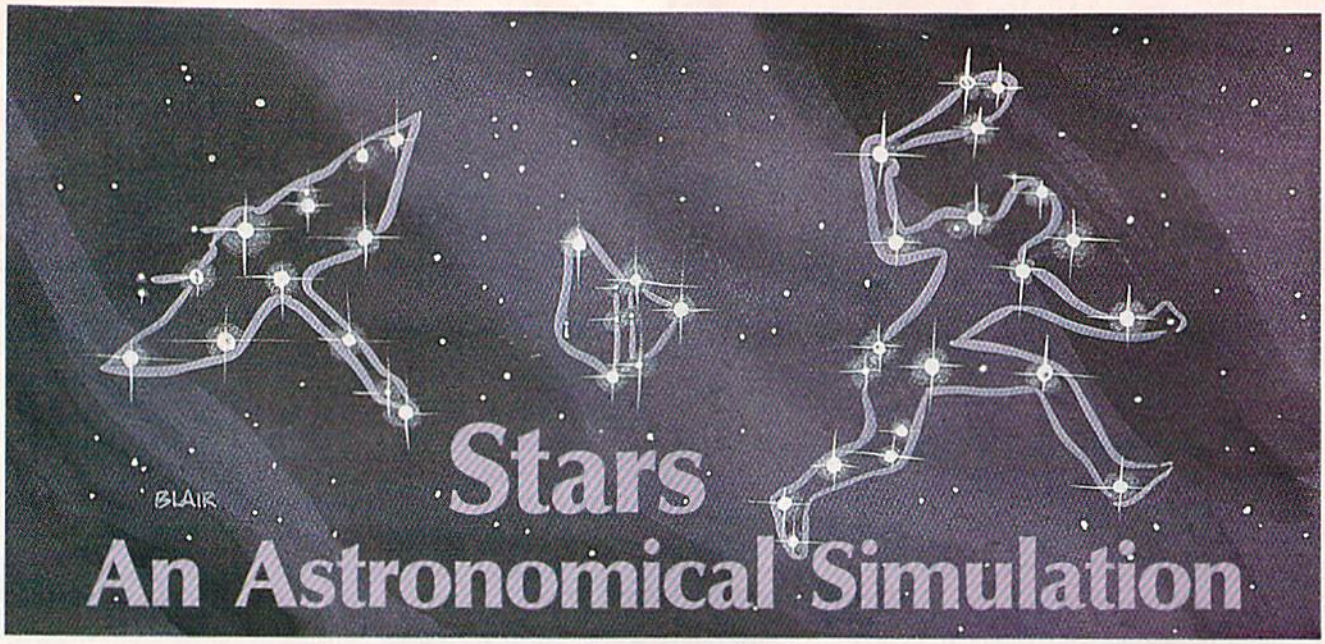


Stars
An Astronomical Simulation

Robert A. Mulford

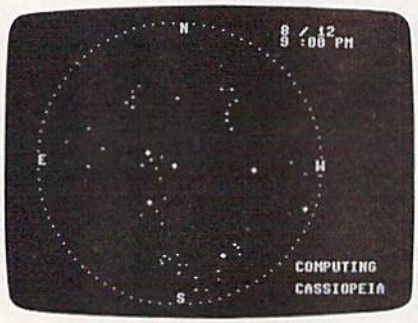
This fascinating program lets you use your Commodore 64 to study the stars. It turns your computer into an interactive star chart by providing the locations of 24 major constellations, in both northern and southern hemispheres, at any hour, on any specified date. It even provides a quiz to enhance study.

"Stars" turns your Commodore 64 into a personal planetarium. It can draw a display of the major star patterns as they appear in the sky, on the date and time you specify, as seen from anywhere on the Earth. With Stars, you can test your knowledge of the sky, or simulate the changing star positions during the course of a night, or from month to month. Stars also prints the name of each major astronomical feature as it is presented. With Stars and a little effort, you'll quickly learn the entire night sky.

Creating Your Own Planetarium

Stars is written entirely in BASIC. When typing it in, be sure to use "The Automatic Proofreader," found elsewhere in this issue, to insure there are no typing mistakes. When you've finished typing it in, save a copy of Stars to disk or tape before running it.

When you first run Stars, you'll be given a menu with four options: quit, simulate the stars, study the constellations, or study the constellations and then take a quiz. For a more detailed explanation of the options, see "The Options" below. To select any of these, simply type 0, 1, 2, or 3 and press RETURN.



"Stars" provides you with a detailed interactive star chart.

After selecting one of the options, you must next specify when and where you wish to view the sky. You can specify the month, day, and time. The year doesn't matter, because on any given date the stars are in the same positions from year to year. The month is entered as a number—January is 1, December is 12. Enter the time of day as a number between 1 and 12, corresponding to the hour, and then specify a.m. or p.m. If you choose option 1—the simulation—you must also decide between hourly and monthly updates of sky motions (more about this below).

Your location on the Earth is specified by your latitude. Enter a number between +90 and −90. (Most maps and atlases show latitude.) Stars can draw the sky as viewed from any latitude, even south of the equator. Use a negative latitude for the southern hemisphere, between 0 and −90 (the equator and South Pole, respectively). Users in most of the United States will get a display similar to their local sky by accepting the default latitude of 40 degrees (use 30 for the southern U.S.).

The Options

When you first run Stars, you must choose one of four options.

Option 0, Quit, returns you to BASIC.

Option 1 is a simulation which draws the sky for any specified date and time. When the star map is completed, Stars automatically recomputes and displays the sky for one hour or one month later. This process repeats continuously. Hold down the CTRL key to end the simulation. It may be necessary to hold the key down for a few seconds. After it finishes the current constellation, the program will return to the menu.

Option 2, Constellation Study, draws the sky for the date selected, and holds the display on the screen for detailed examination. This is useful for learning the shapes of the constellations, or for examining the appearance of the sky at different seasons of the year. Press RETURN

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to go back to the menu.

Option 3 is the Quiz. A star map for the specified date and time is drawn on the screen as the names of the constellations are presented. Then the map is cleared, and as the constellations are redrawn one by one, in random order, you are prompted to type in their names. Type the names carefully and press RETURN. You can correct typing errors by pressing the DEL key. You'll be told whether your entry is correct or not. If your entry is wrong, you'll be presented with the correct name, and the quiz will move on to the next constellation. At the end of the quiz, you'll be told how many answers were right, and the menu will reappear.

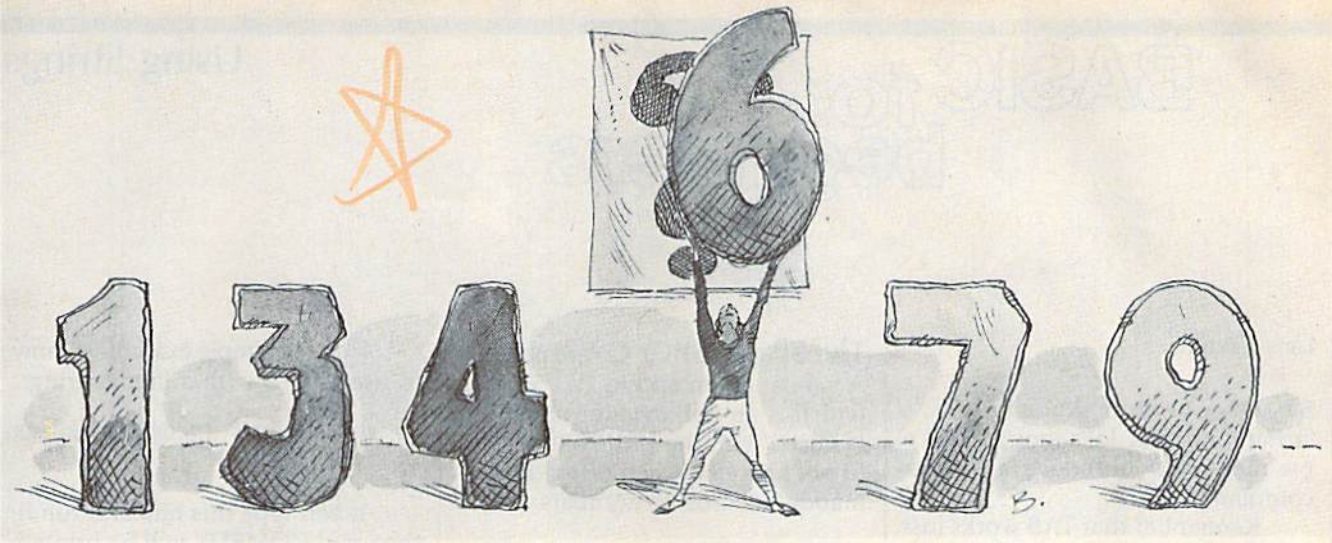
The Sky Display

The same display is used for all options. The entire visible sky is shown, with the zenith (the point directly overhead) at the center of the screen, and the horizon represented by a circle around the edges of the screen. The date and time are shown in the upper right corner of the display. This is the same format commonly used for star charts in books and magazines. The sky is represented as it would be seen if you were lying on your back, looking directly overhead. You'll notice that east is to the left (because we see the sky from "underneath"). This is the opposite of the way terrestrial maps appear.

The stars are displayed as white points on a dark background. If you specify a time before sunset, the background will be blue, otherwise it will be black. Brighter stars appear as larger points on the display. The name of each constellation is shown in the lower right corner of the screen as it is plotted. In a few cases, where a bright star is part of a faint or obscure constellation, the individual star is plotted by itself and its name is given. If a constellation is below the horizon on the date you specified, its name appears only briefly, and then the program proceeds to the next constellation.

In addition to teaching the constellations, Stars can be used to demonstrate many celestial phenomena traditionally shown in a planetarium. It makes an excellent teacher's aid.

See program listing on page 89.



Number, Please?

Fender Tucker

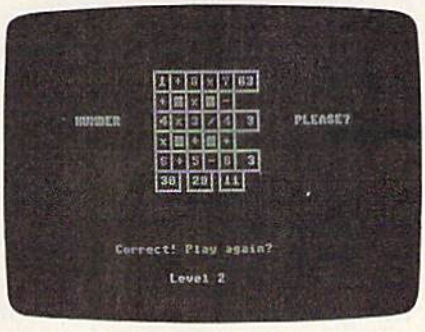
If your children or students are bored with ordinary arithmetic drills, or if you're a little rusty on the math tables yourself, here's a fun way to sharpen addition, subtraction, multiplication, and division skills. For the Commodore 128, 64, Plus/4, and 16. A color monitor is optional.

Even if you think you know your math, you won't want to miss "Number, Please?" Some of the puzzles created by the program are relatively easy, which makes them perfect for children who are learning arithmetic. But sometimes a tricky puzzle comes along, one that could reduce a math professor to tears.

Number, Please? is written in BASIC and runs on the Commodore 128, 64, Plus/4, and 16. After typing it in, save a copy. To get started, load it and type RUN. First, choose a level of play from 0 (the most difficult) to 3 (the easiest). The level number also corresponds to the number of answers that will be revealed before you begin.

Puzzling Numbers

After selecting a level, the arithmetic operation signs flash on the screen until a puzzle is created. Then blue and white numbers appear. The white numbers, in a row at the bottom of the screen, are the available numbers you can select to insert in the blank squares in the puzzle above. You must place these numbers in the boxes above so that the numbers with the arithmetical operations performed on them equal the sum at the end of the rows. Like a crossword puzzle, the numbers and the operations must also equal the number at the bottom of the columns. Addition is shown by +, subtraction by −, multiplication by x, and division by /.



"Number, Please?" is like a mathematical crossword puzzle. It can be played by all age groups.

Move the cursor with the space bar, and when you think you know which number goes in a box, simply type the number. The number disappears from the list. You can skip boxes by pressing the space bar. If you continue to press it, you'll come around to that empty box again.

If you think you've put a number in the wrong box, just type in another number—hopefully the correct one—from the list directly on top of the one in the box, and the two will be exchanged. If you've used all the numbers from the list, however, you can't make any exchanges. The white numbers in the list are printed in random order, so no clues to the solution can be found in the order given.

When you think the puzzle is solved, press RETURN. If you're correct, you can play another game. If something is incorrect, you can try the same puzzle again by typing Y at the prompt. If you don't want to tackle the same puzzle again, press the space bar to reveal the answer. Press the space bar again to go on to another puzzle.

The arithmetic operations are performed in order from left to right and top to bottom. This is different from the usual rules of computer mathematics, where multiplication and division are performed before addition and subtraction. For instance, 9 − 6 / 3 is equal to 1 in this system, not 7 as in normal computations.

Some of the puzzles can be very tricky, but because levels may be selected before each game, players of nearly any age or skill level can play. If you're playing in competition, you can use the level number as a handicap.

See program listing on page 92.

BASIC for beginners

Using Strings

Larry Cotton

Before we begin to explore BASIC's string functions, let's look at TAB a bit more and introduce a similar command, SPC.

Remember that TAB works just like the tab key on a typewriter. We used TAB last month—with the PRINT statement and a string variable—to form two columns of names and office telephone extension numbers. Although it doesn't necessarily have to be associated with a string variable, TAB must be preceded by PRINT. Here are some examples:

```
10 PRINT "{CLR}"
20 PRINT TAB(5) "CASA BLANCA"
30 PRINT TAB(6) "VANGELIS"
40 DE$="DISK DRIVE":PRINT TAB(
   7) DE$
50 A=25:PRINT TAB(7) A
```

Remember not to type a space between TAB and the first parenthesis. And note that, even though both TAB statements contain the number 7, line 50 prints the value of A one more space to the right than line 40 prints the contents of DE$ because (as we've seen) a numeric variable prints an extra space to leave room for the sign.

Type NEW and enter the next short program. A FOR-NEXT loop is used with a numeric variable TAB statement to produce an interesting result.

```
10 PRINT "{CLR}"
20 INPUT "YOUR FIRST NAME";N$
30 PRINT "{CLR}"
40 FOR J=5 TO 27:PRINT TAB(J)
   {SPACE}N$:NEXT
50 GOTO 50
```

As J is incremented, your name is printed from 5 to 27 spaces from the left edge of the screen. Remember that, even though a FOR-NEXT loop can continue counting until its index approaches the upper limit of a floating number, the maximum value of TAB is only 255.

The Space (SPC) Command

A similar command to TAB is SPC, which is an abbreviation for *space*. It's used with the PRINT statement to put space between printed information—words or numbers.

```
10 PRINT "{CLR}"
20 FOR T=1 TO 5
30 INPUT "NAME OF A CAR"; C$
40 PRINT:PRINT C$ SPC(4) T
50 PRINT:NEXT
```

Type this in and run it. When prompted, enter five different car names. Notice that instead of being arranged in columns—as TAB would do—the cars' names and numbers are always separated by four spaces (remember, numbers will have an extra space in front to make room for the sign—positive or negative).

Incidentally, when sent as commands to a printer—at least to my Gemini 10X—TAB and SPC behave identically. If you want to use real tab stops, you must use your printer's own codes for tabbing.

So much for TAB and SPC. Let's begin to explore the versatile world of strings.

Strings

Strings can appear two ways—as *literal strings* like "MONITOR" or as *string variables* like M$.

You also know that string variables can represent just about anything—letters, numbers, even graphics symbols like those on the front of your keyboard's keys—and can be up to 255 characters long. One more thing which you may remember is that strings can be added together (concatenated).

What you may not know is that strings can be manipulated in many other ways, such as excising segments from them, or truncating them to certain lengths. Probably the easiest to understand string-related BASIC statement is LEFT$ (pronounced "left string").

Here's a simple example of how to use LEFT$ with a literal string:

```
10 PRINT LEFT$ ("COMEDY OF ERR
     ORS",6)
```

If you type this line and run it, the word COMEDY will be printed. The computer has grabbed the *six leftmost characters* from the string "COMEDY OF ERRORS". The number after the comma is the number of characters that are extracted.

Please note that, unlike TAB and SPC, you may type a space between LEFT$ and the first parenthesis. However, there's no space between the word LEFT and the dollar sign—the abbreviation for "string." Here's another example using a string variable:

```
10 PRINT "{CLR}"
20 INPUT "PLAY AGAIN"; R$
30 IF LEFT$ (R$,1)= "Y" THEN 5
   0
40 PRINT:PRINT "PROGRAM ENDS."
   :END
50 PRINT:PRINT "PROGRAM CONTIN
   UES..."
60 PRINT:GOTO 20
```

Run this one several times, typing Y, YES, YEAH, SURE, NOPE, UH UH, NO WAY, MAYBE, and HECK NO!. Observe the results. What's happening?

R$ becomes in line 20 whatever we type in. Line 30 then looks at one character—the leftmost character of R$. If it's Y, control is passed to line 50, where the program continues.

But if it's anything else, such as S (for Sure), unfortunately the program ends. How can the programmer possibly anticipate all of the responses the user will type? Simple—limit his or her choices.

```
10 PRINT "{CLR}"
20 INPUT "PLAY AGAIN (Y/N)";R$
30 R$ = LEFT$(R$,1)
40 IF R$<>"Y" THEN IF R$<>"N"
   {SPACE}THEN 10
50 IF R$="Y" THEN 70
60 PRINT:PRINT "PROGRAM ENDS":
   END
```

```
70 PRINT:PRINT "PROGRAM CONTIN
   UES.."
80 PRINT:GOTO 20
```

As you can see, we used LEFT$ to take only the first character of the input. Then we checked to see if that character was either *Y* or *N*.

Let's make another string variable equal to the LEFT$ of a longer string. (As we noted in the December column, string variable names may be any convenient length, but only the first two letters are used by the computer.)

```
10 BIG$ = "UNCLE ALBERT"
20 LITTLE$ = LEFT$ (BIG$,5)
30 PRINT BIG$
40 PRINT LITTLE$
```

BIG$ is seen by the computer as BI$; LITTLE$ is seen by the computer as LI$. The length of the extracted string (UNCLE) is 5—the number after the comma.

That number can also be a numeric variable as in lines 40 and 50 of this program.

```
10 A$ = "MMMMMMMMMMMMMMMMMMMM
   MMMMMMMMMMMMMMMMMM"
20 B$ = "NNNNNNNNNNNNNNNNNNNN
   NNNNNNNNNNNNNNNNNN"
30 PRINT "{CLR}"
40 FOR L=1 TO 39:PRINT LEFT$ (
   A$,L):NEXT
50 FOR L=39 TO 1 STEP -1:PRINT
    LEFT$ (B$,L):NEXT
60 GOTO 40
```

The FOR-NEXT loops print rows of slanted lines, which alternately spread out over the screen, and then gradually disappear.

As you might expect, there's another string-handling BASIC command which extracts the *rightmost* characters of a longer string. That command is RIGHT$. Try this:

```
10 PRINT "{CLR}"
20 INPUT "ANY TEN CHARACTERS";
    T$
30 PRINT:PRINT T$:PRINT
40 INPUT "NUMBER FROM 1 TO 10"
   ;N
50 PRINT:PRINT RIGHT$ (T$,N) "
    IS THE LAST" N "CHARACTER(
   S)."
```

Note that, as in LEFT$, there's no space between RIGHT and the dollar sign. Run this program several times to observe how RIGHT$ works. You might expect that since RIGHT$ would begin counting from the right-hand parenthesis, the characters would be reversed, but they're not. Like LEFT$, the characters are extracted in the order they appear in the string.

To finish up this month, here's a short program which demonstrates one more thing that can be done by taking advantage of LEFT$ and RIGHT$.

```
10 PRINT "{CLR}"
20 FOR T=1 TO 10:PRINT:NEXT
30 Q$="SPLIT MESSAGE DEMONSTRA
   TION!"
40 FOR C=1 TO 14
50 PRINT TAB(20-C) LEFT$ (Q$,C
   ) RIGHT$ (Q$,C)
60 PRINT "{UP}";
70 FOR D=1 TO 50:NEXT
80 NEXT
90 GOTO 90
```

Type this in (note the semicolon at the end of line 60) and run it. If you want to change the message in line 30, by all means do so, but change the 14 in line 40 to half the length of the new string. Also note that the new string should have an even number of characters. To change the speed of the spreading-out action, change the time delay loop in line 70.

We've seen ways to pull shorter strings from the right and left ends of longer strings. Next month, we'll look at a way to pull them out of the middle.

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machine language for beginners

Debugging

Richard Mansfield
Editorial Director

No program of any complexity, in any language, is, after you first finish writing it, error free. There's so much that can go wrong: typos, misnamed variables, odd looping, interaction between subroutines, unexpected input from the user. The list is long.

Machine language (ML) is harder to debug than other languages because it uses more instructions per program, and because the instructions are less easily read, less intuitive. In ML, you generally manipulate a byte at a time. To print a string, you loop through the characters, sending them to the screen one at a time. In BASIC, by contrast, you can print a string as a unit:

```
PRINT "THIS WHOLE STRING."
```

STOP and BREAK

It's been estimated that, on average, debugging represents 50 percent of any programming effort. Whatever the amount of time required to get a program working properly, there are many approaches you can take when debugging an ML program. There are also many effective debugging tools.

Perhaps the most widely used tool in BASIC is the STOP command. You can insert it anywhere in the program and then check the values of variables, the number of times a routine has looped, or whatever else you suspect is causing the problem. There's an equivalent tool in ML: the BRK command. You use it much the same way. Insert it anywhere to create breakpoints which halt program execution and let you check out the environment. Very often you'll discover the suspect lurking there, acting in an obviously erratic manner. A variable named, let's say, COUNTER, is supposed to be increasing, but instead, it's always staying at zero. Somewhere else in the program the variable is being overwritten, or it never gets increased anywhere, or it's being loaded with a zero. But *where*?

To track down this kind of bug, it's useful to be able to search quickly through your source code. Some assemblers allow you to write source code in the BASIC environment. This means that you can use all your usual BASIC programming utilities (such as "MetaBASIC") and easily get a list of all the places where COUNTER appears. You should then be able to see where it is being incorrectly reset to zero.

Using A Monitor

A monitor is an especially valuable debugging tool. The 128 has a monitor built in and there are several available, commercially or from user groups, for the 64. Your debugging will go far more smoothly with a monitor because it allows you to work at a level below BASIC, at the machine langauge level. You should use the BRK instruction, for example, with a monitor.

Aside from revealing the location of a BRK command and immediately showing the condition of your registers, some monitors also provide a powerful single-stepping tool. With this, you can slowly step through your program (near where you suspect a bug) and watch the registers changing. Each instruction is executed, one at a time, and this makes the program *visible* as it goes through its paces.

Another valuable addition to your programmer's bag of tricks is your video screen. If you want to really visualize a problem, temporarily modify your program to cause things to appear onscreen.

To test an ML program, you can create a subroutine which prints to the screen the value of the registers or other variables at key places in your program. If you don't have a single-stepper available, you can at least see where you are within the program by printing the program counter to the screen. (The program counter, part of the microprocessor, always contains the current address of any running program.)

Shown above is a routine, called P, to which you can JSR at any point from within a program and see where you are. If something is going wrong in an ML program, you can insert JSR P instructions in various suspect locations.

Now, any time you JSR P, your screen will display your location within a running ML program. There are many other ways to make problems visible. Try printing the register values onscreen, for example, using the $BDCD (or $8E32) number-printing routines. The register numbers are single-byte, so transfer the register value you want to see into the X register, LDA #0, and JSR $BDCD.

```
P STA A:STY Y:STX X; SAVE REGISTER VALUES
LDA #$BA: JSR $FFD2; PRINT GRAPHICS SYMBOL TO SHOW PC WILL FOLLOW
PLA:TAX:PLA:TAY:PHA:TXA:PHA:TYA; SAVE RTS ADDRESS
JSR $BDCD; PRINT PC ADDRESS (128 OWNERS USE $8E32)
LDA A:LDY Y:LDX X:RTS; RESTORE REGISTERS
A .BYTE 0; TEMPORARY STORAGE FOR REGISTERS
X .BYTE 0
Y .BYTE 0
```

the geos column

GeoPuzzle, Part 1

Rhett Anderson and David Hensley, Jr.

This month we present the first of a two-part series that explores writing machine language programs for **GEOS**. *As part of the tutorial, an intriguing brain teaser—a true* **GEOS** *application—is included.*

The *GEOS* operating system offers many advantages for machine language programmers. Among these are hi-res line-drawing routines and filled-box commands.

What is the price for these new features? Programmers must adjust to a whole new Kernal, for one. Another problem is the scarcity of programming manuals and tools for *GEOS*. Berkeley Softworks promises an assembler that will operate within the *GEOS* environment—but for now, programmers must use their old assemblers and repeatedly switch between operating systems.

"GeoPuzzle" is a unique puzzle that runs under the *GEOS* operating system. It is an application that takes advantage of *GEOS* icons and Kernal routines. Next month, we'll explain how "GeoPuzzle" was programmed.

GeoPuzzle is similar in concept to Rubik's Cube and other multidimensional puzzles. Although it operates in only two dimensions, it still requires that a methodology be used to solve it.

Typing It In

Since GeoPuzzle (Program 1) is written entirely in machine language, you must use "MLX," the machine language entry program found elsewhere in this issue, to type it in. When MLX asks for a starting and ending address, respond with the following values:

Starting address: 0304
Ending address: 07F3

When you've finished typing, save two copies—one to a standard 64 disk, the other to a *GEOS* work disk. The file on the work disk will be converted to *GEOS* format.

Because *GEOS* files are different from normal 64 files, you must use "GeoConvert" (Program 2) to convert the machine language GeoPuzzle program to *GEOS* format. (A description of the conversion program is found later in this article.)

Solving The Puzzle

To play GeoPuzzle, simply click on the GeoPuzzle icon (an empty square) from the *GEOS* deskTop. The board is drawn and the puzzle is presented in its pristine state.

The puzzle is made up of nine squares arranged in a 3 × 3 grid. Twelve arrows surround the square. These arrows are your means of moving the squares.

The squares are connected by colors. Four patches of color are present on the squares. When the puzzle is solved, the colors snap into place. When the puzzle is unsolved, the colors are scrambled. Squares can be distinguished from one another by their patterns. Three different patterns are present on the squares. One is found only on corner pieces, another is found on edge pieces, and yet another is found on the center piece.

Scramble the puzzle by pressing on the arrow icons. When you click on one of these arrows, the three pieces in the row or column indicated will shift their positions in the direction the arrow points.

When you think you've sufficiently scrambled the cube, try to return it to it's original state. Keep in mind that the orientation of a square cannot be changed—only its position can. Also remember that the corner pieces have only one colored corner, the edge squares have two, and the center square has four. The position of the colored patches within the squares is the key to solving the puzzle.

If you can't manage to solve the puzzle, click on the GeoPuzzle icon located in the upper right corner of the screen to reset the cube.

When you've finished playing with GeoPuzzle, click on the *GEOS* icon in the lower right corner of the screen to return to the deskTop.

GeoConverter

Since *GEOS* uses a unique format for its files, *GEOS* applications must be converted if they are written with a standard 64 assembler. The need for such a converter will disappear when a true *GEOS* assembler is released, but until then it is an unfortunate necessity.

Type GeoConverter in and save it to disk. It requires accurate typing, so be sure to use the "Automatic Proofreader," located elsewhere in this issue, when you enter the program. If you wish to run GeoConverter from the deskTop, be sure to save it to a *GEOS* work disk.

When you're ready to use GeoConverter, load and run the program. Insert the disk that contains the program you wish to convert and answer the filename prompt with the name of the file you used to save GeoPuzzle (or any other machine language program that you wish to convert). Be sure to have at least two copies of the file you wish to convert before you run GeoConverter, because the file is modified by GeoConverter. GeoConverter works similarly to the PRGTOGEOS program in Berkeley Softworks' *The Official* GEOS *Programmer's Reference Guide.*

During testing, we discovered that this program occasionally creates a file that gives a system error when run. If this happens to you, make another copy of the file and convert it again. We'll discuss the bugs and typos of PRGTOGEOS in a future column.

See program listings on page 95.

Cricket Graphics

Todd Heimarck
Assistant Editor

This month's column was inspired by a letter from reader Ed Berners, who has been trying to find the *Simons' BASIC* language extension. Originally developed for the VIC-20 by a young English programmer named David Simons, *Simons' BASIC* adds 114 commands to the 64, including many hi-res graphics utilities. It was sold in the U.S. under the Commodore label. Rumor has it that David Simons is now working on software for the Amiga.

Mr. Berners called Commodore, contacted mail-order advertisers, and left messages on CompuServe and QuantumLink. He's had no luck. There's one specific command he needs:

You probably wonder why I don't switch to another extension or a 128. Well, besides its being more powerful generally than anything else, including the 128, there is one instruction in Simons' BASIC *that I can't get along without, and no other high-level language on any micro (except the Macintosh) has it. I'm doing technical graphics and I need to label the axes on linear and log plots of various functions. To do the labeling satisfactorily, I need to move text around the hi-res screen in one-pixel increments, and only* Simons' BASIC, *with its TEXT instruction, makes that possible.*

A phone call to Commodore verified the news. *Simons' BASIC* is no longer available. But the request for a way to position text anywhere on the screen is reasonable enough. It can be done.

Positioning Text On The 128

First, a defense of the 128: While it's true that the CHAR command forces you to place characters on even boundaries within a 40 × 25 grid, it's not true that the 128 lacks the ability to finely position text on the hi-res screen. Here's what you do:

First, turn on the hi-res screen and use CHAR to place one or more characters on the screen. Next, copy the character shape into a string with the SSHAPE command (for several characters or entire alphabets, put the shapes into a string array). Now the shape is stored in the form of a string in memory. That string can be GSHAPEd anywhere on the hi-res screen, in one-pixel increments, without being limited to the 40 × 25 grid.

Positioning Text On The 64

The 64 doesn't have any built-in graphics commands, and manipulation of the hi-res screen requires a slew of PEEKs and POKEs. BASIC is generally slow and cumbersome, so I wrote a machine language utility called "Cricket Graphics."

To type it in, you need MLX, the machine language entry program found elsewhere in this issue. When prompted for the memory locations, provide these numbers:

```
Starting address: C000
Ending address:   C20F
```

The program is 528 bytes long and shouldn't take long to enter. When you're finished typing, save it to disk with the name CRICKET.

Cricket has five entry points, with SYSes located every three bytes from 49152 to 49164. Some of the SYSes must be followed by one or more parameters, which may be numbers, variables, or mathematical expressions.

SYS 49152,1 turns on hi-res mode. **SYS 49152,0** turns it off. The bitmap screen occupies locations 40960–48960 in the RAM under BASIC ROM. The 1000-byte color map starts at 35840 (this makes it compatible with the 64 version of "MetaBASIC"). If you use Cricket from a BASIC program, you'll have to move the top of memory down by about 5K, with this line:

```
1 POKE 55,0: POKE 56,140: CLR
```

SYS 49155 clears the hi-res bitmap by storing zeros into the bitmap memory.

SYS 49158,*F*,*B* fills hi-res color memory with the given colors. The variable *F* should be the foreground color, with *B* as the background color. Color values can range from 0 to 15.

SYS 49161,*M*,*X*,*Y* sets or clears a pixel on the screen. *M* is the mode, where 0 is off, 1 is on, and 2 is flip. Mode 2 reverses the state of a pixel. If it was previously on, it's turned off. If it was off, it's made visible in the current foreground color. *X* is the *x* coordinate, the legal values for which are 0–319. *Y* is the *y* coordinate, which may range from 0–199.

SYS 49164,*S*,*X*,*Y* places a character on the screen. Look up the screen code value and put it in *S*. You may also print a character to the text screen and PEEK the appropriate location. Among screen codes, the letter *A* is code 1, *B* is code 2, and so on. Normal characters are numbered 0–127; reversed characters are 128–255. Either character set may be printed (and they may be mixed on the same screen). To make sure the characters are upper/lowercase, PRINT CHR$(14) before the SYS. For uppercase/graphics mode, PRINT CHR$(142). It's possible to mix letters from both character sets. The *X* and *Y* values should stay within the ranges 0–319 and 0–199, respectively.

Passing Values In Machine Language

Sending calculated values from BASIC to machine language (ML) is an interesting question that generates a lot of reader mail. If you program in ML, you may want to know how it's done. Let's say you put a character on the hi-res screen with the line SYS 49164, INT(RND(1)*256), Z+3, Q*8+3. How do you write a routine that looks inside parentheses and calls

various BASIC functions like INT or RND? How do you find variables in memory? How do you translate those characters into numbers you can use in an ML program?

Within the ML program, you need three routines: First, you need a routine to find and skip over a comma. Second, you need a way to evaluate the expression, which might contain numbers, variables, math operators, parentheses, or functions. Finally, you need to convert the floating-point number to an integer value you can use in your program.

Not surprisingly, the BASIC ROMs already contain all of the routines you need. When BASIC hits a line such as POKE X, ((PEEK(X) AND 240) OR 3), it has to parse the line and split up the commands according the rules of precedence.

The three key routines on the 64 are called COMMA, which looks for and skips commas; FRMEVL, which evaluates formulas; and QINT, which converts a floating-point value to an integer. The respective addresses on the 64 are $AEFD, $AD9E, and $BC9B. After calling these three routines from your ML program, you'll find the high byte of the number in location $64 and the low byte in $65.

For BASIC Programmers

If you'd like to use these routines in your own programs, but you want to locate the hi-res screen somewhere else in memory, don't use the first three SYSes—the ones that enable hi-res, clear the screen, and fill color memory. You'll have to handle these tasks yourself. The other two routines will work with any hi-res screens located anywhere in memory.

When you SYS 49161 to set or clear a pixel or SYS 49164 to put a character on the screen, the program figures out where the hi-res screen resides and adjusts itself accordingly. The only thing you must remember is that the hi-res screen must be enabled. Don't use these SYSes while the normal text screen is visible.

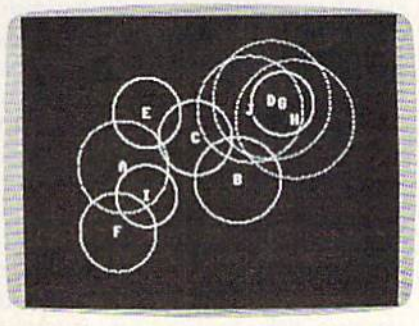
Two Example Programs

Before you start drawing lines and putting characters on the hi-res screen, you have to turn on the hi-res screen, clear it, and set the colors. The following program is an example that randomly picks ten places on the screen and draws circles of random sizes. (You'll need to have Cricket in memory or saved on a disk in the drive.)

Circles Demo

```
SE 10 REM RANDOM CIRCLES
QG 20 K=0:FORJ=49152TO49162:K=
      K+PEEK(J):NEXT
GJ 30 IFK<>1210THENLOAD"CRICKE
      T",8,1
DG 40 POKE 56,140:CLR
MM 50 HR=49152:HZ=HR+3:HC=HR+6
      :HX=HR+9:HP=HR+12
CK 60 SYS HR,1:REM HI-RES ON
QK 70 SYS HZ:REM ZERO SCREEN
SF 80 SYS HC,1,6:REM WHITE ON
      {SPACE}BLUE
QM 90 FORB=1TO10
DE 100 CX=INT(RND(1)*219+50):C
       Y=INT(RND(1)*99+50):CR=
       INT(RND(1)*40+10):GOSUB
       150
GH 110 NEXT
JK 120 GETA$:IFA$=""THEN120
SR 130 SYS HR,0:REM HI-RES OFF
CS 140 END
KC 150 FORI=0TO90STEP2:A=I*↑/1
       80
XB 160 DX=COS(A)*CR:DY=SIN(A)*
       CR*.82
RE 170 SYS HX,1,CX+DX,CY+DY:RE
       M SET PIXELS
AB 180 SYS HX,1,CX-DX,CY+DY
JC 190 SYS HX,1,CX+DX,CY-DY
DQ 200 SYS HX,1,CX-DX,CY-DY
PS 210 NEXT
CS 220 SYS HP,B,CX-4,CY-4:REM
       {SPACE}PRINT CHARACTERS
GE 230 RETURN
```

Lines 20–30 load the Cricket program if it's not already in memory. Line 40 protects the hi-res color memory from BASIC variables. Line 50 gives variable names to the five entry points within Cricket. In lines 60–80, the hi-res screen is turned on, cleared, and set to white foreground and blue background. The main loop at 100–120 counts to ten, selecting random values for CX and CY (the center of the circle) and CR (the radius).



"Cricket" mixes text and graphics on the 64's hi-res screen in the Circles Demo.

The subroutine starting at 150 draws circles. It counts from 0 to 90 degrees in steps of two and plots points using sine and cosine. At the same time, it figures out the three mirror points (one for each of the other quadrants) and sets them, too. As each circle is completed, a letter *A–J* is placed in the middle.

The second program picks 1000 random *x* and *y* coordinates and plots them on the screen.

RND Demo

```
KX 10 REM RND(0) DEMO
JG 20 K=0
AX 30 FORJ=49152TO49162:K=K+PE
      EK(J):NEXT
EJ 40 IFK<>1210THENLOAD"CRICKE
      T",8,1
QG 50 POKE 56,140:CLR
HM 60 HR=49152:HZ=HR+3:HC=HR+6
      :HX=HR+9:HP=HR+12
PP 70 PRINT"FIRST, A DEMO FOR
      {SPACE}RND(0)
CK 80 PRINT"PRESS ANY KEY
CC 90 S=0:GOSUB140
JP 100 PRINT:PRINT"NOW, RND(1)
       , WHICH IS MORE RANDOM
GS 110 PRINT"PRESS ANY KEY
MS 120 S=1:GOSUB140
SR 130 END
RH 140 GOSUB210
FP 150 PRINT"{HOME}{RVS}RND("+
       CHR$(48+S)+")"
DF 160 SYSHR,1:SYSHZ:SYSHC,4,1
       5
CR 170 FORJ=2TO317:FORK=8TO12S
       TEP2:SYSHX,1,J,K:NEXT:N
       EXT
FS 180 FORJ=0TO5:CC=PEEK(1024+
       J):SYSHP,CC,J*8+6,6:NEX
       T
PC 190 FORJ=1TO1000:X=RND(S)*3
       20:Y=RND(S)*200
DC 200 SYSHX,1,X,Y:NEXT:SYSHC,
       1,2
AQ 210 GETA$:IFA$=""THEN210
FJ 220 SYSHR,0:RETURN
```

It doesn't sound very exciting—1000 dots splattered randomly across the screen—but it illustrates the folly of using a zero or a period inside the RND command. The first time, the random numbers are generated by RND(0). The second time, the program uses RND(1). You'll see visual proof that RND(0) is not a very random way to get random values. The points tend to cluster together in diagonal lines.

See program listing on page 105.

Fast Graphics Buffer

James Host

If you want to use simple Commodore commands to send high-resolution graphics from your Commodore 64 to your non-Commodore printer, this month's "Power BASIC" is for you. Although it's written in machine language, no knowledge of machine language programming is necessary.

Non-Commodore printers have several advantages over Commodore printers when it comes to word processing. Many provide a near-letter-quality character set that mimics typewritten script and offers italics, subscripts, superscripts, and so on.

However, non-Commodore printers often have trouble interpreting Commodore graphics commands. Commodore uses nonstandard commands to send dot graphics to a printer. The Commodore 1525/MPS-801/MPS-803 printers are alerted by a CHR$(8) that graphics data will be arriving; then the graphics data is sent as a string. A graphics program will send seven bits of information to the printer, but the most significant bit is also set (the value of the first seven bits plus 128). The short program below, for instance, would print a diagonal line in graphics mode on a Commodore 1525 printer.

```
100 OPEN4,4,4
110 PRINT#4,CHR$(8);:REM TURNS ON
    GRAPHICS MODE
120 PRINT#4,CHR$(129)CHR$(130)
    CHR$(132)CHR$(136);
130 PRINT#4,CHR$(144)CHR$
    (160)CHR$(192)
```

In order to use these commands with a non-Commodore printer, they must be converted by an interface into the standard form acceptable to the printer. Different interfaces do this with varying efficiency.

"Fast Graphics Buffer" speeds printing of dot graphics by recognizing the dot graphics commands and dot graphics of a 1525 printer and converting them to non-Commodore formats. It saves the data until the command CHR$(15) or a non-dot graphics character is sent. (A non-dot graphics character is any character with a value less than 128). When one of these is detected, Fast Graphics Buffer sends the graphics data to the printer in a burst, using the interface's transparent mode.

Typing It In

Although Fast Graphics Buffer is a machine language program, it is in the form of a BASIC loader which POKEs the code into memory. It is recommended that you use the "Automatic Proofreader," found elsewhere in this issue, to insure accurate entry of the program.

How To Use It

After typing in and saving a copy of the program, load it and type RUN. When it has finished POKEing the machine language into memory, load and run your program which sends Commodore-style dot graphics to the printer. The Fast Graphics Buffer will work with most BASIC and machine language programs.

Modifying The Program

As written, the program works with the Cardco ?/+G interface and an Epson-compatible printer. It sends standard, single-density graphics commands. You can customize the program by changing the DATA statements in lines 440 through 510 of the BASIC loader to reflect your printer and interface requirements.

Make sure you have saved a copy of this program to disk before altering it. That way, if you make a mistake, you'll still have a good copy on disk to work with. It might also be a good idea to save modifications of this program with unique filenames, keeping the original to remodify in case you buy a different printer.

Change the number in line 450 to the secondary address that will make your interface completely transparent—with no ASCII correction and no linefeed after the carriage return. Check your interface owner's manual for this information.

If your printer supports more than single-density (double-density or quad-density), change the numbers in lines 500 and 510. Change only the numbers that are there. Don't insert or delete any. In line 500, enter the number of characters in your printer's graphics command; and, in line 510, enter the graphics command itself. Overwrite the 32s if necessary. They are present only to hold space, and aren't otherwise significant. For example, the graphics mode of the Citizen printer is activated by 3 characters: 27, 42, 5. To use Fast Graphics Buffer with the Citizen printer, change lines 500 and 510 to

```
500 DATA 3
510 DATA 27,42,5,32,32,32,32,32
```

You can set your printer's vertical spacing to 7/72 inches (which is the Commodore 1525 printer's vertical spacing while in graphics mode) or set it back to normal by entering the appropriate numbers in lines 460–490. Enter the length of the code necessary to set fine line spacing and standard spacing in lines 460 and 480, respectively; then enter the codes to set the spacing in lines 470 and 490.

Your printer's graphics modes and commands are explained in the manual that came with your printer.

See program listing on page 87.

What, Me Worry?

Fred D'Ignazio
Associate Editor

It was thundering outside; the sky was dark and growing darker. Lightning split the sky. Thunder growled and boomed.

I had my Commodore 128 turned on, and I glanced nervously at the screen to make sure it was still showing the last page of my GAZETTE column. "Please," I prayed silently. "Please don't let the power go out." (I'm not sure whether I was praying to God or to Alabama Power, but I was hoping both were listening.)

"CRASH!" went the thunder.

"Uh oh!" I cried. I pressed some keys and saved the contents of my GAZETTE file for the third time in the last minute.

I got up from the computer and peered out the window. Giant raindrops splashed against the glass, making the world outside seem blurry and fragmented. I hurried back to the computer and typed a couple more words.

"BOOM!" went the thunder.

Near panic, I hurriedly saved my file again.

I tried desperately to finish the article quickly, but I was so distracted by the storm that I couldn't think clearly. I was sure that the power would go out after the next sentence, the next word, the next letter. What's keeping it? I wondered—and worried—as I pecked away at the keys.

As I was typing, it occurred to me just how much I loved electric power. And the reason I loved it was so I could keep my computer turned on.

And I wasn't alone. After the next really loud "KA-BOOM!" in came my entire family—Janet, Catie, Eric, even Mowie the cat. All had been working on their computers—Janet in her study, Eric in the family room, and Catie and Mowie in Catie's bedroom.

"Is the power going off?" Catie asked.

"Is it, Dad?" asked Eric.

I looked at everyone. Their faces were pale. They looked strained and worried. Just like me.

"Only God and the power company can see us through this storm," I said prophetically. And I sent them all packing to make sure they had saved their files, their programs, their spreadsheets, and their adventure games.

An Addictive Quality

As I returned to my computer, it hit me just how dependent our entire family had become on our computers. For example, we recently planned a family reunion at the New Jersey seashore with the Pennsylvania D'Ignazio's and the New York D'Ignazio's. We all wanted to go, but I could tell there was something holding us back.

"I really want to go but . . . ," said my wife.

"But what?" I asked.

"But I won't be able to take my computer," she said in a wee little voice.

"Me neither," said Catie.

"Me neither," echoed Eric.

"Mow," said Mowie.

"What a pathetic group you are," I said, hands on hips, trying to look stern. But inside I knew just how they felt. I had been planning to take my little portable computer to the reunion, but I cringed each time I imagined a wave rushing in and swallowing it up or some beach bully kicking sand into its keyboard.

And earlier today, on the way back from picking the kids up from school, I was thinking about writing my GAZETTE column—until the sky started clouding over, and the air felt like rain. Dire images came flooding into my head: "The power will go off." I thought. "I won't be able to get my column written." My mind raced. "My editor will yell at me. I'll have to write the article on paper. Then I'll have to write it again and again, since I don't know how to write on paper. Next I'll have to drive to the post office since I won't be able to send my article to the GAZETTE over the modem. And I'll have to pay lots of money since the article was due yesterday. But to get money I'll have to go to the bank. Except that my bank account's overdrawn and. . . . "

The chain of catastrophes went on and on.

All because I had seen a few dark clouds in the sky.

Now I'm back at my desk writing my column. I look up. No thunder in the last few minutes. The sky is growing lighter. The storm is departing. Somehow, miraculously, I've almost completed the column, and the power is still on. I want to kiss the screen, to call my family around me and celebrate.

But in the back of my mind floats just the smallest sooty, black cloud. It's there waiting, waiting until the next time I am overdue on a column, waiting to come out and go "BOO!" and scare me nearly to death.

As I dial up COMPUTE!'s data line to send my article, I promise myself that right after I turn in the article I'm going to the local Woolworth's and buy a stack of notebook paper; in fact I'm going to buy paper for the whole family. And we're going to sit down and and all practice writing on the paper. After all, people used to write on paper; back before computers they did it all the time. And you never know, one day, maybe one day soon, our computers might not be there. It could all start with a little black cloud.

Font Printer

For Commodore 1526/MPS-802 Printers

Thomas Carlson

Owners of the Commodore 64 and Commodore 1526 (or MPS-802) printer will find this program to be highly useful. It allows you to print using special fonts. You can use the font included with the article or fonts created with "Ultrafont+." (Also, several extra fonts are available on the GAZETTE Disk for this month—see page 81 for details.) A disk drive is required.

As clear and attractive as the resident font is in the Commodore 1526 and MPS-802 printers, it would be nice to have a choice of fonts. A report on fiber optics might use a futuristic font, or a letter to a friend could be printed in a cursive font. "Font Printer" lets you print in any font you like.

The fonts you use can be created with "Ultrafont+," the popular custom character editor published in the July 1984 and September 1986 (enhanced version) issues and also in *The Complete 64* (from COMPUTE! Books). You can also use the italic font accompanying this article, or one of the fonts included as a bonus with this month's GAZETTE Disk (see "Bonus Fonts," facing page).

Using Font Printer With *SpeedScript* Files

Font Printer works best with sequential files. Many word processors are able to save their documents to disk as sequential files (files followed by the letters SEQ in the directory). There are two ways to convert *SpeedScript* files into sequential files. The first way is to load the text file from *SpeedScript* and print it to disk (with *SpeedScript* versions 3.0 and higher). Press SHIFT–CTRL–P. *SpeedScript* will ask whether to send the file to screen, printer, or disk. Press D for disk. *SpeedScript* will actually print your file to disk, completely formatted, just as it would have printed it on paper.

Another way to convert *SpeedScript* files to sequential files is to use the *SpeedScript* conversion utility found elsewhere in this issue.

Font Printer can print normal *SpeedScript* files (saved as screen codes), but it will include formatting command characters in the

```
THIS IS AN ALL CAPITALS FONT.
ABCDEFGHIJKLMNOPQRSTUVWXYZ  0123456789
ABCDEFGHIJKLMNOPQRSTUVWXYZ  !#$%&'()+-

This is the standard C64 character set.
abcdefghijklmnopqrstuvwxyz  0123456789
ABCDEFGHIJKLMNOPQRSTUVWXYZ  !#$%&'()+-

THIS IS A COMPUTER FONT.
ABCDEFGHIJKLMNOPQRSTUVWXYZ  0123456789
ABCDEFGHIJKLMNOPQRSTUVWXYZ  !#$%&'()+-

THIS IS A STRANGE FONT.
ABCDEFGHIJKLMNOPQRSTUVWXYZ

This is an italics font.
abcdefghijklmnopqrstuvwxyz  0123456789
ABCDEFGHIJKLMNOPQRSTUVWXYZ  !#$%&'()+-
```

Each of these fonts is available on the GAZETTE Disk. Data for the italic font character set is listed elsewhere in this magazine.

printout. Also, the printout will not be formatted. The formatting commands (such as the center-text command) print as reverse characters. To avoid this, it's best to convert your *SpeedScript* files to sequential files for use with Font Printer.

Program listings can also be converted to sequential files for printing. To do this, first load the program you want to list. Insert the disk you want to list to and type the following:

```
OPEN 8,8,8,"0:filename,S,W":
  CMD8,"title":LIST
```

In this example, *filename* is the name of the file you wish to convert and *title* is the name you would like printed at the top of the listing. When the drive stops, enter

```
PRINT#8:CLOSE8
```

Typing It In

Font Printer (Program 1) is a BASIC program with a short machine language routine. Simply enter the program using the "Automatic Proofreader," found elsewhere in this issue.

After typing it in, save a copy to disk. To use Font Printer, load it and type RUN. You will first be prompted for a font filename. Insert a disk containing a custom font, type in the font filename, and press RETURN. After Font Printer loads the custom font, you'll be prompted for a document (text) filename. Once again, enter the filename and press RETURN.

Finally, Font Printer asks whether your file is a screen code file (a *SpeedScript* file, for example). If you are printing a sequential file, as recommended, enter *N*. If your text file is in the form of screen codes. enter *Y*.

Bonus Fonts

The author has created five fonts (character sets) that can be used with Font Printer. Because of space restrictions, we cannot include all five fonts in the magazine (each one is 2K in length). One of these, the italic font, appears as Program 2 in the "Program Listings" section of the magazine. The other four fonts—Capitals, Standard, Computer, and Strange, which are shown in the figure on page 80—are included as separate files on this month's GAZETTE Disk.

Font Printer will convert your file to the new font and send each character to the printer. (The procedure for sending redefined characters to the Commodore 1526/MPS-802 printer is explained below.) As this is not a rapid process, Font Printer is best used for a letter or a page or two of material.

The Italic Font

The italic font (Program 2) must be entered with "MLX," the machine language entry program found elsewhere in this issue. When MLX is first run, it will prompt you for starting and ending addresses. Respond with the following values:

```
Starting address:  7000
Ending address:    77FF
```

After you've finished typing it in, be sure to save a copy to disk.

How Font Printer Works

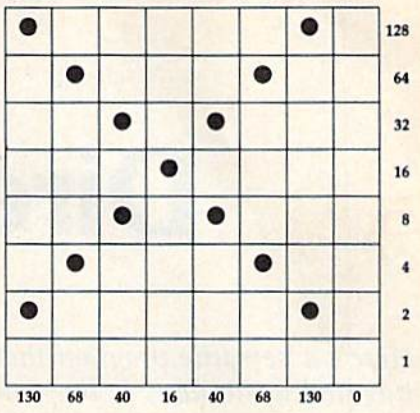
Font Printer first converts the font by turning each character "on its side." This is necessary because the bytes which make up each character of the Commodore 64 character set are stacked vertically. The first byte of each character is at the top of the character, and the last is at the bottom. As shown in the accompanying table, the printer must receive its characters horizontally. The first byte is at the left, and the last is at the right. Font Printer rotates the characters with a machine language routine. It takes about one second. Font Printer then defines these characters one by one as custom characters for the printer.

If you consult your Commodore 1526 or MPS-802 printer manual, you'll discover that there is a way to define one custom character. Unlike some printers, which allow you to put a complete character set in RAM (Random Access Memory), you must define characters sent to the Commodore 1526 one character at a time.

If you wish to define a single custom character for the Commodore 1526 printer, your character should be defined on an 8 × 8 grid To define an X, for instance, you might draw your grid as it appears in the example provided.

Dot-matrix printers like the Commodore 1526 print by pressing pins onto paper through an inked ribbon. The numbers along the

Character Laid Out On 8 × 8 Grid.



right side of the grid in the figure above represent the values that must be sent to the printer in order to cause the pin in that row to strike the paper. In order to activate the top pin and the second pin from the bottom, the number 130 must be sent to the printer. You can see 130 under the first column of the grid. Adding the numbers in the second column gives you 68; the third column totals 40, and so on. These numbers have to be sent to the printer as characters—CHR$(130), CHR$(68), and so on. The easiest way to send characters is as a string. Say you want to define the new character as NC$. Simply set NC$ equal to the string of characters.

```
NC$=CHR$(130)+CHR$(68)+CHR$
  (40)+CHR$(16)+CHR$(40)+CHR$
  (68)+CHR$(130)+CHR$(0)
```

The string has to be sent to the printer's custom character buffer. You notify the printer of this by sending the string with a *secondary address* of 5. To send this instruction to the printer, type

```
OPEN 1,4,5:PRINT#1,NC$
```

Then, through another channel, tell the printer to print the new character (now defined as CHR$(254) because the printer's custom character buffer is defined as character 254).

```
OPEN 2,4:PRINT#2,CHR$(254)
```

Since the custom character must be redefined for each character you print in your custom font, printing with Font Printer can be quite slow. Be sure the document you plan to print with Font Printer is free of errors. After waiting an hour for your document to print, you don't want to find a word misspelled in the last paragraph.

See program listings on page 88.

Directory Magic

Tracy A. Eichheim

Here's a versatile program that helps keep your disk directories tidy and up-to-date. It lets you alphabetize directories, change filenames, or move directory entries where you want them. It also allows you to scan the contents of both program and text files. For the Commodore 64. Not for use with GEOS disks.

This disk directory manager lets you do things that you'll come to think of as magic. With "Directory Magic," you can alphabetize a directory in a wink of the eye; you can change filenames, scratch files, lock files to prevent accidental deletion, or unlock locked files. You can also rearrange the directory any way you wish. You can grab any directory entry and put it wherever you want in the directory. You can put all your utilities together, group games, or slide your unfinished programs to the end. To save yourself some typing, move your favorite program to the first slot in the directory so that you can load it with LOAD "*",8,1 (a command that loads the first file found in the directory).

Have you ever scratched a program by accident? Directory Magic displays the titles of scratched programs and lets you unscratch them. Another useful feature lets you read almost any file on the disk—BASIC program files as well as text files (including *SpeedScript* files). Using this feature, you can read a program to make sure it's the one you want to scratch. Or you can read a scratched file to see if it's intact before you unscratch it. If you're hunting for a certain program but aren't sure which disk it's on, you can use Directory Magic to look at each program on a disk, scrolling from title to title. And if you haven't found it, simply press RUN/STOP and then rerun Directory Magic with another disk.

Getting Started

Directory Magic is written entirely in machine language, so you'll need to use "MLX," the machine language entry program found elsewhere in this issue, to type it in. When MLX asks for a starting and ending address, respond with these values:

Starting address: 0801
Ending address: 1B80

When you've finished typing in the data, be sure to save a copy to disk before leaving MLX. Test your copy of Directory Magic on an unimportant disk to make sure that your copy works correctly. Be sure to use a test disk with programs that are backed up on another disk, since even one typing error could ruin a disk directory.

To use the program, type LOAD"*filename*",8 and then type RUN. Even though it's written in machine language, you can load Directory Magic as if it were a BASIC program. Following the instructions on the first screen, insert the disk that you want to organize and then press any key. When the title screen appears, the border will change color once for each sector of the directory as it is read into memory. When Directory Magic has read the directory, the main screen displays the commands available and the first 14 directory entries.

Instant Action

Directory Magic executes commands with only one or two keypresses. The commands are listed on the screen, so you won't have to refer to this article each time you use it. You'll see each command key in reverse video as the first letter of the command name. Some keystrokes must be accompanied with either the SHIFT or CTRL keys, which are both shown in reverse, next to the command name. The function key definitions are also shown in reverse. Pressing f7 scrolls the directory entries in one direction, while f5 scrolls them in the other. You can see 20 filenames on the screen at a time.

The center line of the screen is called the *grab line*. On the right side of the grab line is the directory title under examination. Following the name, you may see a symbol for an unclosed file (*) or for a locked file (<). On the left side, you'll see the number of blocks used by the program, the starting track and sector of the program, and its file type (PRG, SEQ, and so on). Pressing f1 changes the color of the directory title in the grab line. This shows that the name has been grabbed. Pressing either f5 or f7 scrolls the directory entries up and down while the entry in the grab line remains unchanged. This is the first step in moving a filename to any other place in the directory list. Pressing f3 inserts the grabbed name into the list at the grab line location.

When you want to change a filename, position the name on the grab line and press C for Change name. Enter the new name without using quotation marks and press RETURN. If you're in upper-/lowercase mode, the capital letters aren't shown until you release the SHIFT key. If you press SHIFT-RETURN without entering a name, or if you use any illegal symbols or cursor controls in the new name, you'll return to the main screen.

Files may either be Read (press R) or Inspected (press I). Reading a BASIC program file lists the file on the screen, but—unlike the BASIC LIST command—the file is not actually present in memory and cannot be run. If you read a machine language program file, no disassembly is listed, but the starting

memory location of the machine language program is shown at the beginning of the file. This is useful if you forget the SYS location for a machine language program. Hold down any key to pause scrolling, or press RUN/STOP to stop reading the file. Otherwise, Directory Magic will continue reading the file until it reaches the end.

If the file in the grab line is a sequential file (SEQ) or a machine language program, press I to inspect the contents. The screen display will split, showing text on one side and screen codes on the other. Again, machine language files won't be disassembled, but you can often identify words or sentences that are included in the program.

If you want to get rid of old versions of a file, you can check the contents of your programs with either R or I to determine which versions you want to delete. Then press D to delete the file shown in the grab line. Files can be deleted as fast as you can scroll and press D.

Pressing A alphabetizes the directory entries by filename. The sorting routine automatically ignores deleted files so they are not mixed in with your other files. This makes it easier to find a file on a disk with a crowded directory. Files may be locked (press L) or unlocked (press O). Locked files cannot be deleted, so using L is a good way to protect your prize programs from an untimely demise.

More About Deleting Files

The delete command is not the only command you can use to remove files from the disk. You can also scratch whatever file is shown in the grab line by pressing CTRL-S. All the other Directory Magic commands affect only the copy of the directory in memory, but this one scratches the file from the disk, not from the copy in memory. When you press CTRL-S, the drive will whir and the file will be gone.

All the names of deleted files are displayed in reverse video. These files may or may not be complete, since the disk operating system (DOS) may have used part of the scratched program's disk space to store another program. Deleted files can either be read or inspected (depending on the original file type) to see if they are files that you want to restore. If the original program has not been overwritten by the DOS, you can press U for unscratch. Directory Magic will then ask you to indicate whether the deleted file is a program file (PRG) or a sequential file (SEQ). Pressing the 1 or 2 key will unscratch the file. (Directory Magic does this by changing the file-type byte from 00—which means a deleted file to DOS—to either 129 or 130.) If you change your mind, pressing RETURN cancels the unscratch command and returns you to the main screen. If, when you read or inspect the file, you find that it has been overwritten, *do not unscratch* the file. Unscratching an overwritten file can lead to damage to other files on the disk. If you must recover data from the overwritten file, make a copy of the disk and work on the copy.

You can grab a deleted file and move it anywhere you want, just as if it were a program or sequential file. If you press M for move, Directory Magic collects all of the deleted files and moves them to the bottom of the list. (SHIFT-M moves deleted files to the top of the list.) This makes it much easier to rearrange the working files and programs.

Deleting Problem Files

Unclosed files (also known as *splat* files) are marked with an asterisk (*). These occur when the drive is interrupted while it is writing a file. As a result, a splat file doesn't have an end-of-file marker. Ordinarily you can't safely scratch unclosed files, but Directory Magic safely scratchs them when you press D for delete. You cannot use CTRL-S to safely delete splat files.

Have you ever been plagued by a program named " , "? These names are generally created by accidentally saving a program with a comma as the filename. If you've ever tried to delete a comma filename, you know that they don't just go away. Press D, and the comma is gone. If the comma file is an important program, you can rename it so you can use it.

Coup De Grace

When you have finished your disk editing task, press CTRL-F. It is at this point that the revamped directory in memory is written to the disk. Following this, the disk will automatically be Validated. This allows new programs to use the space taken up by files that you have deleted. Directory Magic prevents you from writing a directory to the wrong disk. It alerts you if you have switched disks or if you have a tab covering the write-protect notch, and it gives you the opportunity to replace the disk or remove the tab.

Changing Colors

If you wish to change the default screen colors, load Directory Magic, but don't run it. Then POKE a new value into the color registers listed below. (For example, POKE 2061,6 changes the border to dark blue). You can find the color values listed in most reference books for the Commodore 64. You can run the program to check the new colors, press RUN/STOP and POKE a new value, and then run it again. When you have the color combinations that you like, press RUN/STOP and save Directory Magic. Be sure to use a different filename for the new version of the program.

Default Color			Location to POKE
Black	(0)	Border	2061
Black	(0)	Background	2062
Yellow	(7)	Print	2063
Dk gray	(11)	ScrollNames	2064
Green	(5)	FormatScreen	2065
Lt blue	(14)	NameLineColor	2066
Blue	(6)	GrabColor	2067
Purple	(4)	Error msg	2068
White	(1)	Misc msg	2069
Lt blue	(14)	Border 2	2070
Lt gray	(15)	Background 2	2071
Blue	(6)	Print 2	2072

How The Program Works

Directory Magic reads the entire directory from track 18 and places it in memory in the space following the program itself. After all of the filenames are read into memory, a block above and a block below the filenames are both filled with blanks so miscellaneous garbage in memory doesn't appear on the screen. Shifting names is accomplished by moving the entire 30 bytes that hold the name. Since all your actions affect memory only, nothing is changed on the disk until you press CTRL-F, which writes the entire directory back onto the disk. The one exception is the CTRL-S (scratch) command, which immediately scratches the file from the disk.

See program listing on page 99.

simple answers to common questions

Tom R. Halfhill, Staff Editor

Each month, COMPUTE!'s Gazette tackles some questions commonly asked by Commodore users. If you have a question you'd like to see answered here, send it to this column, c/o COMPUTE!'s Gazette, P.O. Box 5406, Greensboro, NC 27403.

Q. I was wondering if there is any difference between Commodore computers sold in Europe and in the United States, and if we could use European-made hardware and software in America.

A. There are indeed some differences that might affect the operation of foreign hardware and software on your Commodore computer in the U.S.

The obvious thing that's different about computers made for sale in foreign countries is the power supply. In the U.S., household electrical outlets provide 110–120 volts of alternating current at a frequency of 60 hertz. In Europe, the standard is 220 volts of AC at 50 hertz. If you want to use any European hardware that doesn't tap its power from the computer, you'll have to get a power adapter.

The power supply difference may also indirectly affect the speed at which some foreign software runs on your U.S. computer. Here's why:

Video monitors and TVs work by repeatedly displaying the video image we see on their picture tubes. The image fades in a fraction of a second, but it's redisplayed or *refreshed* so quickly that we're fooled into perceiving a steady, flicker-free picture. For design reasons, the refresh rate is synchronized to the alternating current frequency of the power supply. Therefore, video monitors in the U.S. refresh the image 60 times per second, while European monitors refresh the image 50 times per second.

This, in turn, can affect the speed of some programs that are synchronized to the refresh rate. Many programmers, especially when writing games, use a technique that updates the screen each time the video image is refreshed. For instance, sprite shapes might be changed and moved to new positions between video "frames." Since this happens 60 times per second on a computer in the U.S.—instead of 50 times per second on a computer in Europe—the foreign-made game might appear to run faster over here. However, sometimes the processing speeds of computers sold internationally are slightly speeded up to compensate for this difference.

Another thing to keep in mind with European software is that you'll probably need a cassette drive to load it. Disk drives are much less common over there, so most software is published on cassette.

Don't buy a modem designed for European computers; because of differences in the telephone systems, modems aren't compatible.

If you want to order products from Europe, our advice is to write first to clear up any compatibility questions. Also, make sure you can get a refund if something doesn't work.

Q. In the August 1987 column you set the record straight about emulators. Now that you've explained how emulators cannot work, what about emulators that *do* work in spite of your statement? They started this question in the first place. Not only improved systems that run old software, such as the Commodore 128 with Commodore 64 software, and the Atari 7800 game system with 2600 software; but also different systems like the ColecoVision videogame machine with Atari 2600 cartridges, the Commodore 64's and 128's ability to use CP/M with little or no intervening software, the Amiga 2000's Bridge card for IBM PC software, and the Amiga 500's and 1000's Sidecar for PC software. How do these emulators work?

A. To begin with, the August column never stated that emulators cannot work. Indeed, it stated that emulators can *always* be made to work, but usually aren't practical due to the Three Laws of Emulation we proposed: *1. Any computer can emulate any other computer as long as speed is not a consideration. 2. Any computer can emulate any other computer as long as expense is not a consideration. 3. In general, therefore, forget about emulators.*

None of the emulators you mentioned violates these laws. In fact, they take advantage of the second law by eliminating expense as a consideration. For instance, the Commodore 128 doesn't really *emulate* a 64 or a CP/M computer—it *contains* a 64 and a CP/M computer. When you buy a 128, you're buying three computers in one box. The technology underlying the 64 and CP/M has become so inexpensive that the total price isn't objectionable. The same holds true for the Atari 2600; the components for this ten-year-old videogame machine cost only a few dollars and fit on a circuit board the size of your hand, so the 2600 "emulator" that plugs into a ColecoVision is really just a 2600 in disguise.

The Amiga Bridge card and Sidecar also adhere to the second law. Both "emulators" are basically stripped-down IBM PC clones that use the Amiga's keyboard and screen. You could buy an Amiga 500 and a PC clone for roughly the same price. The practicality of hardware emulation is purely a factor of component cost; you can make a toaster emulate an IBM PC simply by adding hardware, but is it practical?

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Animator 64

Paul Piciocchi

Produce your own short animated feature with this high-speed page-flipping program. "Animator 64" uses character graphics to draw full-screen frames for animation on your Commodore 64. It also provides a boot program for attaching animation as a title screen to the beginning of your own program. A disk drive is required.

"Animator 64" allows you to design and save ten screens of graphics, text, and color and then to animate them by flipping quickly through the screens. Whether you want to create a captivating introduction to a program of your own or you want to design an animated sequence just for fun, Animator 64 makes it easy. There is no need to design ten screens separately. Your original screen can readily be transferred to subsequent screens and then modified to create the animation you desire.

Getting Started

Begin by typing in Animator 64 (Program 1), which is written in BASIC. Be sure to use the "Automatic Proofreader," found elsewhere in this issue, to avoid typing errors when entering the program. When you finish typing in Animator 64, save it to disk. To use it, load it and type RUN.

After a brief pause, this menu of options is displayed:

```
0-9) EDIT SCREEN  D)ISPLAY
C)OPY SCREEN      P)ARAMETERS
S)AVE TO DISK     L)OAD FROM DISK
E)XIT
```

For all menu choices except Edit, type the first letter of the command. To choose Edit, enter the number (0–9) of the screen you wish to edit.

Edit a frame: Type a number from 0–9 in order to edit any of the 10 frames in memory. After selecting one of these, you'll be in Edit mode in the frame (screen) you have chosen. Move your cursor anywhere on the frame, type text, use graphics, change cursor color, or perform any other keyboard function.

Be careful not to move your cursor past the bottom of the frame. If you do so, the frame will scroll upward, ruining the graphic. Once you have finished designing the frame, press RETURN to exit Edit mode. Next, you may either press RETURN again (to save the frame to memory) or type *A* (to abort the save). If you have previously saved a design for the frame, *A* will erase your most recent modifications, leaving the frame as it was before you began editing. To erase the frame entirely, hold down SHIFT and press the CLR/HOME key.

Copy a frame: The traditional method of animation is to draw a picture and then change it slightly from frame to frame. The Copy selection on the main menu allows you to transfer your design to subsequent frames and then modify them. This way you avoid having to redesign the entire screen. In the Copy mode, there are three prompts to answer: which frame to copy, and the first and last frames of the section to copy it to (for example, you might wish to design frame 1 and copy it to frames 2–5). If you press RETURN three times without typing a number, Animator 64 will use the default values, which will copy the last frame you edited to the next frame.

Parameters: Your animation may be further personalized by changing various parameters to be used when the finished product is displayed. You may alter the time interval between frames, the action taken after the last frame, the number of frames to be displayed, and the background color. When you choose Parameters from the main menu, each of these options will be listed on the screen. You will be prompted for a new value for each option in turn. Pressing RETURN at the prompt leaves the value unchanged. If you do not change the parameters, your animation will be displayed with the following default parameters: pause between frames of 50 (which is equivalent to 1/20 of a second between frames), background color of black, high frame (last frame to be displayed) is 9 (all 10 screens will be displayed), and Backward/Forward set to 1, which means the animation will be displayed continuously—first forward, then in reverse order.

If you wish to make modifications to the parameters, you may do so as follows.

Pause: Enter a number at the prompt for each frame 0–9 to determine the length of pause between the frames. The higher the number, the longer the pause.

Background: Type in the number of the color you desire (1 for black, 2 for white, 3 for red, and so on).

High frame number: Frames are numbered 0–9. Simply type in the number of the final frame you wish displayed.

Backward/Forward: When Animator 64 has displayed the entire animation, it has two options: repeat the display forward or alternate forward and backward displays. Typing 0 at Backward/Forward will cause the display to repeat itself beginning to end until you press RETURN. Typing 1 will cause it to continuously alternate forward, backward, forward, and so on, until you press RETURN.

If one of the parameters is out of range, you'll be prompted to fill in a new value for that parameter.

Load and Save: After selecting either load or save at the menu, simply enter the filename and press RETURN.

Animator Booter

Once your animation has been completed and saved, use Animator Booter (Program 2) to create a professional title screen for a program of your own. Here's how to edit Animator Booter to customize it for your own programs.

In line 20, assign the filename for your animation to the variable S1$.

In line 30, assign the the name of the program to boot to the variable S2$.

In line 40, assign the command used to run your program (for example, RUN or SYS 49152) to the variable S3$.

Be sure to resave the program (with a unique filename, in case you have made an error) after making these modifications.

The author wishes to thank Noam Littman for writing the machine language subroutine for Animator 64.

See program listings on page 91.

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," elsewhere in this issue.

Power BASIC: Fast Graphics Buffer

Article on page 78.

```
KC 10 REM COPYRIGHT 1987 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
BB 20 PRINT"{CLR}{BLK}
      {3 SPACES}COPYRIGHT 1987
       COMPUTE! PUB., INC."
CA 30 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED"
RD 40 PRINT"{DOWN}PLEASE WAIT,
       POKING GRAPHIC BUFFER M
      L."
JQ 50 FORI=51000TO51567:READK:
      POKEI,K:X=X+K:NEXT
HB 60 IFX<>71483THENPRINT"
      {DOWN}ERROR IN DATA STAT
      EMENT.":STOP
DF 70 SYS51000:PRINT"{DOWN}THE
       GRAPHIC BUFFER IS NOW A
      CTIVE."
EH 80 PRINT"{DOWN}HIT STOP/RES
      TORE TO DEACTIVATE."
AR 90 PRINT"{DOWN}SYS 51000 TO
       REACTIVATE. "
FQ 100 DATA 173,38,3,141,64,20
       1,169,90,141,38,3,173,3
       9,3,141,65
XX 110 DATA 201,169,199,141,39
       ,3,169,0,141,68,201,141
       ,66,201,141,67
BG 120 DATA 201,96,234,234,234
       ,8,141,62,201,142,60,20
       1,140,61,201,165
KR 130 DATA 154,205,83,201,240
       ,13,173,62,201,174,60,2
       01,172,61,201,40
FE 140 DATA 108,64,201,173,68,
       201,208,13,173,62,201,2
       01,8,208,231,32
JS 150 DATA 230,199,76,162,199
       ,173,62,201,48,28,32,10
       2,200,173,62,201
AE 160 DATA 201,15,208,210,32,
       47,200,76,162,199,174,6
       0,201,172,61,201
MQ 170 DATA 173,62,201,40,24,9
       6,8,120,165,1,72,169,48
       ,133,1,173
MS 180 DATA 62,201,141,0,208,1
       04,133,1,40,24,169,1,10
       9,187,199,141
HF 190 DATA 187,199,169,0,109,
       188,199,141,188,199,24,
       169,1,109,66,201
FX 200 DATA 141,66,201,169,0,1
       09,67,201,141,67,201,76
       ,162,199,32,174
DA 210 DATA 255,169,1,141,68,2
       01,173,83,201,32,177,25
       5,173,84,201,9
HD 220 DATA 96,32,147,255,173,
       85,201,162,86,160,201,3
       2,21,201,32,174
PK 230 DATA 255,165,186,32,177
       ,255,166,185,224,255,20
       8,2,169,0,138,9
QX 240 DATA 96,32,147,255,169,
       0,141,66,201,141,67,201
       ,169,0,141,187
GS 250 DATA 199,169,208,141,18
       8,199,96,32,174,255,169
       ,0,141,68,201,173
GJ 260 DATA 83,201,32,177,255,
       173,84,201,9,96,32,147,
       255,173,94,201
CQ 270 DATA 162,95,160,201,32,
       21,201,32,174,255,165,1
       86,32,177,255,166
CB 280 DATA 185,224,255,208,2,
       162,0,138,9,96,32,147,2
       55,96,173,66
BG 290 DATA 201,13,67,201,208,
       1,96,32,174,255,173,83,
       201,32,177,255
EM 300 DATA 173,84,201,9,96,32
       ,147,255,173,103,201,16
       2,104,160,201,32
XA 310 DATA 21,201,173,66,201,
       32,168,255,173,67,201,3
       2,168,255,8,165
QE 320 DATA 1,72,169,0,141,170
       ,200,169,208,141,171,20
       0,120,169,48,133
KA 330 DATA 1,173,0,208,162,54
       ,134,1,88,41,127,162,0,
       142,59,201
MQ 340 DATA 74,46,59,201,232,2
       24,8,208,247,173,59,201
       ,32,168,255,24
QA 350 DATA 169,1,109,170,200,
       141,170,200,169,0,109,1
       71,200,141,171,200
HR 360 DATA 174,170,200,236,18
       7,199,208,196,174,171,2
       00,236,188,199,208,188
BC 370 DATA 32,174,255,165,186
       ,32,177,255,166,185,224
       ,255,208,2,162,0
MR 380 DATA 138,9,96,32,147,25
       5,169,0,141,66,201,141,
       67,201,169,0
JQ 390 DATA 141,187,199,169,20
       8,141,188,199,104,133,1
       ,40,96,201,0,240
KD 400 DATA 33,141,63,201,165,
       253,72,165,254,72,132,2
       54,134,253,174,63
DQ 410 DATA 201,160,0,177,253,
       32,168,255,200,202,208,
       247,104,133,254,104
XS 420 DATA 133,253,96,0,0,0,0
       ,0,0,0,0,0,0,0,80,82,73
CP 430 DATA 78,84,69,82,32,80,
       65,82,65,77,83
KM 440 DATA 4: REM PRINTER DEV
       ICE NO.
FB 450 DATA 5: REM SECONDARY A
       DDRESS - TRANSPARENT, N
       O LINE-FEED
RH 460 DATA 3: REM NUMBER OF C
       HARACTERS IN VERTICAL S
       PACING 7/72 INCH COMMAN
       D
DB 470 DATA 27,65,7,32,32,32,3
       2,32:REM VERTICAL SPACI
       NG 7/72 COMMAND + SPACE
       S
DE 480 DATA 3: REM NUM OF CHAR
       S IN SET VERTICAL SPACI
       NG TO NORMAL COMMAND
BS 490 DATA 27,50,20,32,32,32,
       32,32: REM SET VERT SPA
       CING TO NORMAL +
MP 500 DATA 2: REM NUMBER OF C
       HARS IN GRAPHICS-ON COM
       MAND
AX 510 DATA 27,75,32,32,32,32,
       32,32: REM GRAPHICS-ON
       {SPACE}COMMAND + SPACES
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," elsewhere in this issue.

Font Printer

Article on page 80.

Program 1: Font Printer

```
KC 10 REM COPYRIGHT 1987 COMPU
      TE! PUBLICATIONS, INC. -
      ALL RIGHTS RESERVED
JG 20 REM C64 & 1526 (OR 802)
      {SPACE}PRINTER ONLY
FP 30 PRINT"{CLR}{BLU}
      {3 SPACES}COPYRIGHT 1987
      COMPUTE! PUB., INC."
SC 40 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED":GOSUB46
      0
SC 50 DIMCH(80):II=51200
JH 60 SYS49152:IFPEEK(49449)=1
      THENGOSUB450:GOTO60
ER 70 PRINT:INPUT"DOCUMENT FIL
      ENAME";F$:PRINT
HE 80 INPUT"IS THE DOCUMENT SA
      VED AS SCREEN CODES
      {3 SPACES}(IE., SPEEDSCR
      IPT FILES)";K$
KD 90 SF=0:G$=",S,R":IFLEFT$(K
      $,1)="Y"THENG$=",P,R":SF
      =1
JC 100 PRINT"{CLR}{4 DOWN}
       {4 RIGHT}INSERT TEXT DI
       SK AND PRESS A KEY"
HB 110 POKE198,0:WAIT198,1:POK
       E198,0
ER 120 OPEN15,8,15:OPEN8,8,8,"
       0:"+F$+G$
EE 130 CLOSE8:INPUT#15,A,B$:CL
       OSE15
KD 140 IFA<>0THENPRINT"ERROR -
        ";B$:PRINT:GOSUB450:GO
       TO70
MQ 150 OPEN8,8,8,"0:"+F$+G$
CE 160 OPEN4,4:OPEN5,4,5
RQ 170 FL=0:GET#8,A$,A$
FJ 180 PS=0
SS 190 IFFL<>0THENCLOSE8:CLOSE
       5:PRINT#4:CLOSE4:GOTO39
       0
BE 200 GET#8,A$:FL=ST:IFSFANDA
       SC(A$)>127THENCH(PS)=32
       :GOTO250
BE 210 IFA$=CHR$(13)OR(SFANDA$
       =CHR$(31))THENCH(PS)=-1
       :GOTO280
JB 220 IFSFTHENCH(PS)=ASC(A$):
       GOTO250
KR 230 PRINT"{CLR}";CHR$(34);A
       $
AP 240 CH(PS)=PEEK(1025)
PH 250 PS=PS+1:IFFL<>0THENCH(P
       S)=-1
RR 260 IFPS=80THENCH(PS)=-1:GO
       TO280
JC 270 GOTO200
AS 280 PS=0
PD 290 B=CH(PS)
XJ 300 IFB=-1THENPRINT#4:GOTO1
       80
JH 310 A$=""
KF 320 FORJ=II+8*BTOII+8*B+7
KC 330 A$=A$+CHR$(PEEK(J))
FG 340 NEXT
PX 350 PRINT#5,A$
KH 360 PRINT#4,SPC(PS);CHR$(25
      4);CHR$(141);
MC 370 PS=PS+1
GS 380 GOTO290
HG 390 PRINT"{CLR}"
CB 400 POKE198,0
EX 410 PRINT" DO YOU WANT TO P
      RINT ANOTHER DOCUMENT"
DG 420 PRINT"{9 SPACES}USING T
      HIS FONT";:INPUT"
      {2 SPACES}N{3 LEFT}";AN
      $
JG 430 IFLEFT$(AN$,1)="Y"THENP
      RINT"{CLR}{DOWN}":GOTO7
      0
BB 440 END
SG 450 FORT=1TO1500:NEXT:RETUR
      N
CM 460 PRINT"{2 DOWN}...LOADIN
      G ML":FORI=49152TO49503
      :READA:X=X+A:POKEI,A:NE
      XT
JS 470 IFX<>44368THENPRINT"
       {2 DOWN}ERROR IN DATA S
       TATEMENT.":END
BE 480 RETURN
SK 490 DATA 169,52,160,193,32,
       30,171,32,74,192
FM 500 DATA 32,11,193,32,159,1
       92,169,0,133,251
CF 510 DATA 141,40,193,160,200
       ,132,252,162,7,160
MM 520 DATA 7,177,251,106,145,
       251,126,42,193,136
DQ 530 DATA 16,245,202,16,240,
       160,7,185,42,193
MC 540 DATA 145,251,136,16,248
       ,24,165,251,105,8
SB 550 DATA 133,251,165,252,10
       5,0,133,252,206,40
GM 560 DATA 193,208,210,96,160
       ,0,140,41,193,132
SR 570 DATA 204,132,253,32,228
       ,255,162,8,221,30
AD 580 DATA 193,240,246,202,16
       ,248,164,253,201,20
MH 590 DATA 208,5,192,0,240,23
       1,136,201,13,240
CD 600 DATA 13,204,39,193,240,
       221,201,20,240,4
PD 610 DATA 153,96,193,200,162
       ,1,134,205,166,207
JG 620 DATA 208,252,120,32,210
       ,255,88,201,13,208
RX 630 DATA 196,169,0,153,96,1
       93,169,1,133,205
AG 640 DATA 165,207,208,252,16
       9,1,133,204,96,169
CD 650 DATA 15,168,162,8,32,18
       6,255,169,0,32
KC 660 DATA 189,255,32,192,255
       ,169,1,162,8,160
KP 670 DATA 0,32,186,255,173,5
       1,193,162,96,160
XX 680 DATA 193,32,189,255,169
       ,0,162,0,160,200
RM 690 DATA 32,213,255,32,207,
       192,96,162,15,32
CR 700 DATA 198,255,32,207,255
       ,141,50,193,201,48
DK 710 DATA 240,36,169,1,32,19
       5,255,32,204,255
HA 720 DATA 169,13,32,210,255,
       173,50,193,32,210
GS 730 DATA 255,162,15,32,198,
       255,32,207,255,201
CH 740 DATA 13,208,241,169,1,1
       41,41,193,32,204
JB 750 DATA 255,169,15,32,195,
       255,96,169,96,133
RS 760 DATA 251,160,193,132,25
       2,160,255,200,177,251
EH 770 DATA 208,251,140,51,193
       ,96,0,145,17,157
BB 780 DATA 29,148,34,19,147,1
       6,0,0,0,0
GD 790 DATA 0,0,0,0,0,0,0,0,0,14
       7,17
BP 800 DATA 17,73,78,83,69,82,
       84,32,70,79
QG 810 DATA 78,84,32,68,73,83,
       75,32,38,32
FP 820 DATA 69,78,84,69,82,32,
       70,79,78,84
GH 830 DATA 32,70,73,76,69,78,
       65,77,69,58
GP 840 DATA 13,0
```

Program 2: Italic Font

See instructions in article on page 80 before typing in.

```
7000:1E 33 37 6E 60 62 3C 00 8F
7008:00 00 1E 03 3E 66 3E 00 E4
7010:00 30 30 3E 66 66 7C 00 AC
7018:00 00 1E 30 60 60 3C 00 BC
7020:00 03 03 1F 66 66 3E 00 5D
7028:00 00 1E 33 7E 60 3C 00 ED
7030:00 07 0C 1F 18 18 18 00 97
7038:00 00 1F 33 66 3E 06 7C E4
7040:00 30 30 3E 66 66 66 00 B0
7048:00 0C 00 1C 18 18 3C 00 87
7050:00 03 00 03 06 06 06 3C B2
7058:00 30 30 36 78 6C 66 00 F0
7060:00 1C 0C 0C 18 18 3C 00 24
7068:00 00 66 7F FE D6 C6 00 EE
7070:00 00 3E 33 66 66 66 00 E5
7078:00 00 1E 33 66 66 3C 00 95
7080:00 00 3E 33 66 7C 60 60 A2
7088:00 00 1F 33 66 3E 06 07 BF
7090:00 00 3E 33 60 60 60 00 B1
7098:00 00 1F 30 3C 06 7C 00 53
70A0:00 0C 3F 0C 18 18 0E 00 6A
70A8:00 00 33 33 66 66 3E 00 6C
70B0:00 00 33 33 66 3C 18 00 7F
70B8:00 00 63 6B FE 7C 6C 00 7F
70C0:00 00 33 1E 18 3C 66 00 68
70C8:00 00 33 33 66 3E 0C 78 FF
70D0:00 00 3F 06 18 30 7E 00 78
70D8:3C 30 30 30 30 30 3C 00 A7
70E0:06 09 18 7C 30 62 FC 00 D6
70E8:3C 0C 0C 0C 0C 0C 3C 00 36
70F0:00 18 3C 7E 18 18 18 18 B0
70F8:00 10 30 7F 7F 30 10 00 B8
7100:00 00 00 00 00 00 00 00 E2
7108:0C 0C 0C 18 00 00 18 00 27
7110:66 66 66 00 00 00 00 00 8C
7118:66 66 FF 66 FF 66 66 00 94
7120:0C 1F 30 3C 06 7C 18 00 EC
7128:31 33 06 18 30 66 46 00 5A
7130:1E 33 1E 38 67 66 3F 00 89
7138:06 0C 18 00 00 00 00 00 24
7140:0C 18 30 30 30 18 0C 00 32
7148:30 18 0C 0C 0C 18 30 00 AC
7150:00 66 3C FF 3C 66 00 00 CF
7158:00 18 18 7E 18 18 00 00 4D
7160:00 00 00 00 00 18 18 30 04
7168:00 00 00 7E 00 00 00 00 33
7170:00 00 00 00 00 18 18 00 E3
7178:00 03 06 0C 18 30 60 00 DF
7180:1E 33 33 66 66 66 3C 00 51
7188:0C 0C 1C 18 18 18 7E 00 97
7190:1E 33 03 0C 30 60 7E 00 70
7198:1E 33 03 1C 06 66 3C 00 BB
71A0:03 07 1F 66 7F 06 06 00 31
71A8:3F 30 3E 06 06 66 3C 00 A1
71B0:1E 33 30 7C 66 66 3C 00 82
71B8:3F 33 06 18 18 18 18 00 9B
71C0:1E 33 33 3C 66 66 3C 00 EE
71C8:1E 33 33 3E 06 66 3C 00 14
71D0:00 00 0C 00 00 18 00 00 95
71D8:00 00 0C 00 00 18 18 30 FD
71E0:0E 18 30 60 30 18 0E 00 DA
71E8:00 00 7E 00 7E 00 00 00 8F
71F0:70 18 0C 06 0C 18 70 00 95
```

```
71F8:1E 33 03 0C 18 00 18 00 C9
7200:00 00 00 FF FF 00 00 00 E4
7208:0C 1E 33 7E 66 66 66 00 62
7210:3E 33 33 7C 66 66 7C 00 D4
7218:1E 33 30 60 60 66 3C 00 F9
7220:3C 36 33 66 66 6C 78 00 53
7228:3F 30 30 78 60 60 7E 00 C7
7230:3F 30 30 78 60 60 60 00 93
7238:1E 33 30 6E 66 66 3C 00 2B
7240:33 33 33 7E 66 66 66 00 73
7248:1E 0C 0C 18 18 18 3C 00 DB
7250:0F 06 06 0C 0C 6C 38 00 42
7258:33 36 3C 70 78 6C 66 00 35
7260:30 30 30 60 60 60 7E 00 F6
7268:63 77 7F D6 C6 C6 C6 00 19
7270:33 3B 3F 7E 6E 66 66 00 67
7278:1E 33 33 66 66 66 3C 00 4B
7280:3E 33 33 7C 60 60 60 00 C4
7288:1E 33 33 66 66 3C 0E 00 56
7290:3E 33 33 7C 78 6C 66 00 D1
7298:1E 33 30 3C 06 66 3C 00 65
72A0:3F 0C 0C 18 18 18 18 00 7C
72A8:33 33 33 66 66 66 3C 00 06
72B0:33 33 33 66 66 3C 18 00 1D
72B8:63 63 63 D6 FE EE C6 00 43
72C0:33 33 1E 18 3C 66 66 00 99
72C8:33 33 33 3C 18 18 18 00 8F
72D0:3F 03 06 18 30 60 7E 00 58
72D8:1C 08 49 7F 49 08 1C 00 91
72E0:C0 C0 30 30 C0 C0 30 30 F8
72E8:18 18 18 18 18 18 18 18 CD
72F0:33 33 CC CC 33 33 CC CC 6F
72F8:33 99 CC 66 33 99 CC 66 DD
7300:00 00 00 00 00 00 00 00 E6
7308:F0 F0 F0 F0 F0 F0 F0 F0 EE
7310:00 00 00 00 FF FF FF FF F6
7318:FA 22 23 22 22 00 00 00 9C
7320:00 00 00 00 00 00 00 FF 07
7328:C0 C0 C0 C0 C0 C0 C0 C0 0F
7330:CC CC 33 33 CC CC 33 33 7D
7338:03 03 03 03 03 03 03 03 1F
7340:00 00 00 00 CC CC 33 33 5A
7348:CC 99 33 66 CC 99 33 66 62
7350:03 03 03 03 03 03 03 03 37
7358:18 18 18 1F 1F 18 18 18 E7
7360:00 00 00 00 0F 0F 0F 0F 29
7368:18 18 18 1F 1F 00 00 00 4F
7370:02 04 08 1E 04 08 10 20 BC
7378:00 00 00 00 00 00 FF FF 5F
7380:00 00 00 1F 1F 18 18 18 FA
7388:18 18 18 FF FF 00 00 00 84
7390:00 00 00 FF FF 18 18 18 20
7398:18 18 18 F8 F8 18 18 18 94
73A0:5E 50 DC 50 5E 00 00 00 5E
73A8:E0 E0 E0 E0 E0 E0 E0 E0 8F
73B0:07 07 07 07 07 07 07 07 97
73B8:FF FF 00 00 00 00 00 00 9F
73C0:12 00 33 33 66 66 3E 00 93
73C8:12 00 1E 33 66 66 3C 00 F4
73D0:01 03 06 6C 78 70 60 00 C6
73D8:00 00 00 00 F0 F0 F0 F0 DD
73E0:0F 0F 0F 0F 00 00 00 00 E5
73E8:F9 62 34 18 2C 46 9F 00 27
73F0:F0 F0 F0 F0 00 00 00 00 B9
73F8:F0 F0 F0 F0 0F 0F 0F 0F A3
7400:E1 CC C8 91 9F 9D C3 FF 3A
7408:FF FF E1 FC C1 99 C1 FF F4
7410:FF CF CF C1 99 99 83 FF 3D
7418:FF FF E1 CF 9F 9F C3 FF 3D
7420:FF FC FC E0 99 99 C1 FF AC
7428:FF FF E1 CC 81 9F C3 FF 2C
7430:FF F8 F3 E0 E7 E7 E7 FF 92
7438:FF FF E0 CC 99 C1 F9 83 55
7440:FF CF CF C1 99 99 99 FF 99
7448:FF F3 FF E3 E7 E7 C3 FF D2
7450:FF FC FF FC F9 F9 F9 C3 B7
7458:FF CF CF C9 87 93 99 FF 89
7460:FF E3 F3 F3 E7 E7 C3 FF 66
7468:FF FF 99 80 01 29 39 FF AB
7470:FF FF C1 CC 99 99 99 FF C4
7478:FF FF E1 CC 99 99 C3 FF 25
7480:FF FF C1 CC 99 83 9F 9F 28
7488:FF FF E0 CC 99 C1 F9 F8 1B
7490:FF FF C1 CC 9F 9F 9F FF 39
7498:FF FF E0 CF C3 F9 83 FF A7
74A0:FF F3 C0 F3 E7 E7 F1 FF A0
74A8:FF FF CC CC 99 99 C1 FF AE
74B0:FF FF CC CC 99 C3 E7 FF AB
74B8:FF FF 9C 94 01 83 93 FF BB
74C0:FF FF CC E1 E7 C3 99 FF E2
74C8:FF FF CC CC 99 C1 F3 87 5B
74D0:FF FF C0 F9 E7 CF 81 FF F2
74D8:C3 CF CF CF CF CF C3 FF D3
74E0:F9 F6 E7 83 CF 9D 03 FF B4
74E8:C3 F3 F3 F3 F3 F3 C3 FF 65
74F0:FF E7 C3 81 E7 E7 E7 E7 FA
74F8:FF EF CF 80 80 CF EF FF 03
7500:FF FF FF FF FF FF FF FF EA
7508:F3 F3 F3 E7 FF FF E7 FF B6
7510:99 99 99 FF FF FF FF FF 61
7518:99 99 00 99 00 99 99 FF 69
7520:F3 E0 CF C3 F9 83 E7 FF 21
7528:CE CC F9 E7 CF 99 B9 FF C3
7530:E1 CC E1 C7 98 99 C0 FF A4
7538:F9 F3 E7 FF FF FF FF FF 1A
7540:F3 E7 CF CF CF E7 F3 FF 1C
7548:CF E7 F3 F3 F3 E7 CF FF B1
7550:FF 99 C3 00 C3 99 FF FF 9E
7558:FF E7 E7 81 E7 E7 FF FF 31
7560:FF FF FF FF FF E7 E7 CF 8A
7568:FF FF FF 81 FF FF FF FF 6B
7570:FF FF FF FF FF E7 E7 FF CA
7578:FF FC F9 F3 E7 CF 9F FF DE
7580:E1 CC CC 99 99 99 C3 FF 7D
7588:F3 F3 E3 E7 E7 E7 81 FF 47
7590:E1 CC FC F3 CF 9F 81 FF 7E
7598:E1 CC FC E3 F9 99 C3 FF 43
75A0:FC F8 E0 99 80 F9 F9 FF DD
75A8:C0 CF C1 F9 F9 99 C3 FF 7D
75B0:E1 CC CF 83 99 99 C3 FF AC
75B8:C0 CC F9 E7 E7 E7 E7 FF A3
75C0:E1 CC CC C3 99 99 C3 FF 60
75C8:E1 CC CC C1 F9 99 C3 FF 4B
75D0:FF FF F3 FF FF E7 FF FF D9
75D8:FF FF F3 FF FF E7 E7 CF 81
75E0:F1 E7 CF 9F CF E7 F1 FF B4
75E8:FF FF 81 FF 81 FF FF FF 10
75F0:8F E7 F3 F9 F3 E7 8F FF 1A
75F8:E1 CC FC F3 E7 FF E7 FF F5
7600:FF FF FF 00 00 FF FF FF EC
7608:F3 E1 CC 81 99 99 99 FF 7F
7610:C1 CC CC 83 99 99 83 FF 1D
7618:E1 CC CF 9F 9F 99 C3 FF 08
7620:C3 C9 CC 99 99 93 87 FF BE
7628:C0 CF CF 87 9F 9F 81 FF 5A
7630:C0 CF CF 87 9F 9F 9F FF 9E
7638:E1 CC CF 91 99 99 C3 FF 17
7640:CC CC CC 81 99 99 99 FF DE
7648:E1 F3 F3 E7 E7 E7 C3 FF 86
7650:F0 F9 F9 F3 F3 93 C7 FF 30
7658:CC C9 C3 8F 87 93 99 FF 4D
7660:CF CF CF 9F 9F 9F 81 FF 9B
7668:9C 88 80 29 39 39 39 FF 89
7670:CC C4 C0 81 91 99 99 FF 4B
7678:E1 CC CC 99 99 99 C3 FF 77
7680:C1 CC CC 83 9F 9F 9F FF 0E
7688:E1 CC CC 99 99 C3 F1 FF 8C
7690:C1 CC CC 83 87 93 99 FF 21
7698:E1 CC CF C3 F9 99 C3 FF 9D
76A0:C0 F3 F3 E7 E7 E7 E7 FF 96
76A8:CC CC CC 99 99 99 C3 FF 1D
76B0:CC CC CC 99 99 C3 E7 FF 16
76B8:9C 9C 9C 29 01 11 39 FF FF
76C0:CC CC E1 E7 C3 99 99 FF B9
76C8:CC CC CC C3 E7 E7 E7 FF D3
76D0:C0 FC F9 E7 CF 9F 81 FF 1B
76D8:E3 F7 B6 80 B6 F7 E3 FF F1
76E0:3F 3F CF CF 3F 3F CF CF 9A
76E8:E7 E7 E7 E7 E7 E7 E7 E7 D5
76F0:CC CC 33 33 CC CC 33 33 44
76F8:CC 66 33 99 CC 66 33 99 E5
7700:FF FF FF FF FF FF FF FF EE
7708:0F 0F 0F 0F 0F 0F 0F 0F F6
7710:FF FF FF FF 00 00 00 00 FE
7718:05 DD DC DD DD FF FF FF 69
7720:FF FF FF FF FF FF FF 00 0F
7728:3F 3F 3F 3F 3F 3F 3F 3F 17
7730:33 33 CC CC 33 33 CC CC B8
7738:FC FC FC FC FC FC FC FC 27
7740:FF FF FF FF 33 33 CC CC FB
7748:33 66 CC 99 33 66 CC 99 04
7750:FC FC FC FC FC FC FC FC 3F
7758:E7 E7 E7 E0 E0 E7 E7 E7 9E
7760:FF FF FF FF F0 F0 F0 F0 6D
7768:E7 E7 E7 E0 E0 FF FF FF 57
7770:FD FB F7 E1 FB F7 EF DF F9
7778:FF FF FF FF FF FF 00 00 67
7780:FF FF FF E0 E0 E7 E7 E7 DB
7788:E7 E7 E7 00 00 FF FF FF 62
7790:FF FF FF 00 00 E7 E7 E7 D6
7798:E7 E7 E7 07 07 E7 E7 E7 72
77A0:A1 AF 23 AF A1 FF FF FF B8
77A8:1F 1F 1F 1F 1F 1F 1F 1F 97
77B0:F8 F8 F8 F8 F8 F8 F8 F8 9F
77B8:00 00 FF FF FF FF FF FF A7
77C0:ED FF CC CC 99 99 C1 FF C3
77C8:ED FF E1 CC 99 99 C3 FF 72
77D0:FE FC F9 93 87 8F 9F FF B0
77D8:FF FF FF FF 0F 0F 0F 0F A9
77E0:F0 F0 F0 F0 FF FF FF FF B1
77E8:06 9D CB E7 D3 B9 60 FF 80
77F0:0F 0F 0F 0F FF FF FF FF FD
77F8:0F 0F 0F 0F F0 F0 F0 00 33
```

Stars

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```
KC 10 REM COPYRIGHT 1987 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
HX 20 POKE55,0:POKE56,84:CLR:R
      D=↑/180
MM 30 DIMSX(150),SY(150),SM(20
      0),MO(12),C$(35),CS(35),
      ET(12),MT(12),B%(35)
SF 40 PRINT"{CLR}{8}{4 RIGHT}C
      OPYRIGHT 1987 COMPUTE! P
      UB., INC."
JB 50 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED"
HG 60 PRINT"{2 DOWN}"TAB(16)"
      {RVS}{DOWN} STARS {OFF}"
      :PRINT"{DOWN}PLEASE WAIT
       20 SECONDS..."
EM 70 FORI=1TO12:READET(I),MT(
      I):NEXT
FX 80 FORI=1TO33:READA:POKE491
      51+I,A:X=X+A:NEXT
FS 90 IFX<>5810THENPRINT"ERROR
       IN ML DATA STATEMENT.":
      STOP
SC 100 POKE56334,PEEK(56334)AN
      D254:POKE1,PEEK(1)AND25
      1
KK 110 SYS49152:POKE1,PEEK(1)O
      R4:POKE56334,PEEK(56334
      )OR1
QG 120 FORI=1TO4:READPO(I),DI(
      I):NEXT:GOSUB550
MA 130 FORI=1TO12:READMO(I):NE
      XT
FF 140 FORI=0TO3:A%(I)=PEEK(63
      +I):NEXT:PRINT"{CLR}":Q
      Z=0
GJ 150 POKE198,0:PRINT"{RVS}
      {6 SPACES}MENU
      {6 SPACES}{OFF}"
BD 160 PRINT"(PRESS RETURN FOR
       DEFAULT RESPONSES)":PR
      INT"{2 DOWN}0 - QUIT"
SS 170 PRINT"1 - SIMULATION":P
      RINT"2 - CONSTELLATION
      {SPACE}STUDY"
CG 180 PRINT"3 - CONSTELLATION
       STUDY WITH QUIZ":INPUT
      "{DOWN}{RVS} CHOICE (1
      {SPACE}- 3):{OFF} 2
      {3 LEFT}";AA
KP 190 IFAA<1ORAA>3THENEND
XG 200 ONAAGOTO210,250,250
CB 210 AA=4:INPUT"{2 DOWN}
```

```
      {RVS}HOURLY OR MONTHLY
      {SPACE}SIMULATION(H OR
      {SPACE}M){OFF}
      {2 SPACES}M{3 LEFT}";A$
FA 220 IFA$="H"THENHB=1:DB=0:G
      OTO250
RD 230 IFA$="M"THENHB=0:DB=30:
      GOTO250
FA 240 GOTO210
HK 250 GOSUB1270:GOSUB590
RM 260 IS=0:LB$="COMPUTING":X=
      869:GOSUB840
XJ 270 READRA:IFRA>0THEN320
KK 280 IFRA=0THEN380
SK 290 READLB$:CI=RA*-1:X=949:
      BH=0:IFLA>.5ANDCI=20THE
      N380
MK 300 GOSUB1260:GOSUB840
DX 310 SM(IS)=6:SX(IS)=CI:IS=I
      S+1:C$(CI)=LB$:GOTO360
BX 320 READDC,MG:IFBH=1THENMG=
      5:GOTO350
MH 330 GOSUB1500:IFAL<0THENMG=
      5:BH=1:GOTO350
SS 340 GOSUB930:IFAA>1THENGOSU
      B750
EE 350 SX(IS)=X:SY(IS)=Y:SM(IS
      )=MG:IS=IS+1
SK 360 IFPEEK(653)=4THENGOSUB4
      90:GOTO150
EQ 370 GOTO270
CS 380 SM(IS)=255:IFAA=4THENAA
      =1:GOTO410
BB 390 ONAAGOTO400,480,960
XA 400 GOSUB590:GOSUB700
JC 410 A2=A2+HB:IFA2>=24THENA2
      =A2-24:DD=DD+1:JD=JD+1
PJ 420 DD=DD+DB:JD=JD+DB
JF 430 IFDD>MO(MM)THENDD=DD-MO
      (MM):MM=MM+1:IFMM>12THE
      NMM=1
SG 440 IFDD>MO(MM)THEN430
CX 450 TM=INT(A2)+AN/60
FR 460 FORI=0TO3:POKE63+I,A%(I
      ):NEXT:LA=LA/RD
JM 470 GOSUB1380:GOTO260
EE 480 LB$="PRESS RETURN":X=86
      8:GOSUB1260:GOSUB840:PO
      KE198,0:WAIT198,1
QM 490 FORI=0TO3:POKE63+I,A%(I
      ):NEXT:LA=LA/RD:GOSUB50
      0:GOTO150
BD 500 POKE53272,20:POKE56576,
      3:POKE53265,PEEK(53265)
      AND223:POKE648,4:POKE53
      280,15
AF 510 RETURN
QS 520 XC=INT(X0/8):YR=INT(Y0/
      8):LN=Y0AND7
MK 530 PT=AD+YR*320+XC*8+LN:XB
      =7-(X0AND7)
KD 540 POKEPT,PEEK(PT)OR2↑XB:R
      ETURN
MR 550 S8=32769:L8=8000:N6=327
      68:POKE40769,0:GOSUB860
      :AD=N6
XC 560 FORI=1TO180STEP2:X0=127
      *SIN(2*I*RD)+127:Y0=100
      *COS(2*I*RD)+100
BA 570 GOSUB520:NEXT
JA 580 FORJ=1TO4:X=PO(J):Y=DI(
      J):GOSUB850:NEXT:RETURN
CG 590 BG=0:IFTM>MT(MM)ANDTM<E
      T(MM)THENBG=6
FD 600 POKE53280,BG:AD=24576:S
      8=23553:L8=1000:N6=2355
      2:POKE24553,BG+16:GOSUB
      860
KJ 610 S8=32768:L8=8000:N6=AD:
      GOSUB860
QC 620 POKE53265,PEEK(53265)OR
      32:POKE53272,120:POKE56
      576,2:AD=24576
SM 630 X=27:LB$=STR$(MM):GOSUB
      820
AB 640 X=29:Y=376:GOSUB850
MA 650 X=31:LB$=STR$(DD):GOSUB
      820
DG 660 A4=INT(A2):TD$="AM":IFA
      4>=12THENTD$="PM":IFA4>
      12THENA4=A4-12
FQ 670 X=67:LB$=STR$(A4):GOSUB
      820:X=69:Y=464:GOSUB850
PQ 680 A4=INT(AN):X=70:LB$=STR
      $(A4):IFLEN(LB$)=2THENL
      B$=" 0"+RIGHT$(LB$,1)
BE 690 GOSUB820:X=73:LB$=TD$:G
      OSUB840:RETURN
RG 700 IS=0
JG 710 MG=SM(IS):X=SX(IS):Y=SY
      (IS):IFMG=255THENRETURN
SM 720 IFX=0THEN740
HA 730 GOSUB750
ME 740 IS=IS+1:GOTO710
FM 750 ONMGGOTO760,790,800,800
      ,810,810
SG 760 X0=X:Y0=Y+1:GOSUB520:X0
      =X+1:Y0=Y:GOSUB520:X0=X
      +2:Y0=Y:GOSUB520
XA 770 X0=X+3:Y0=Y+1:GOSUB520
MC 780 X0=X+1:Y0=Y+2:GOSUB520:
      X0=X+2:Y0=Y+2:GOSUB520
BD 790 X0=X+1:Y0=Y+1:GOSUB520
HD 800 X0=X+2:Y0=Y+1:GOSUB520
SK 810 RETURN
EK 820 FORJ=1TOLEN(LB$)-1:Y=(V
      AL(MID$(LB$,J+1,1))+48)
      *8:GOSUB850:X=X+1
BS 830 NEXT:RETURN
JC 840 FORJ=1TOLEN(LB$):Y=(ASC
      (MID$(LB$,J,1))-64)*8:G
      OSUB850:X=X+1:NEXT:RETU
      RN
CS 850 L8=7:S8=21504+ABS(Y):N6
      =AD+X*8:GOSUB860:RETURN
DJ 860 L8=L8+1:E6=N6+L8:E8=S8+
      L8
MH 870 A%=L8/256:A6=L8-256*A%
XR 880 B%=(E6-A6)/256:B6=E6-25
      6*B%-A6
SF 890 C%=(E8-A6)/256:C6=E8-25
      6*C%-A6
CF 900 POKE781,A%+1:POKE782,A6
      :POKE91,C%:POKE90,C6:PO
      KE89,B%:POKE88,B6
QS 910 IFA6=0THENSYS41971:RETU
      RN
RS 920 SYS41964:RETURN
PB 930 AZ=2*↑-AZ:Q=SIN(↑/4-AL/
      2)/COS(↑/4-AL/2)
EQ 940 X=INT((100*Q*SIN(AZ)+10
      0)*1.27)
AG 950 Y=99-INT(100*Q*COS(AZ))
      :RETURN
BK 960 IS=1:I=0:GOSUB590:LB$="
      SORTING":X=950:GOSUB840
FC 970 BH=0
BQ 980 IFSM(I)=255THENCS(IS)=0
      :GOTO1050
RB 990 CS(IS)=SX(I)
PS 1000 IFSM(I+1)>5THENI=I+1:G
      OTO980
GR 1010 I=I+1:IFSM(I)=5THENBH=
      1
CH 1020 IFSM(I)<6THEN1010
FE 1030 IFBH=0THENIS=IS+1
BC 1040 GOTO970
SQ 1050 NC=IS-1
CX 1060 FORI=1TONC:B%(I)=I:NEX
      T
BR 1070 FORJ=1TO5:FORK=1TONC:L
      =B%(INT(RND(1)*NC+1)):
      T9=B%(K):B%(K)=B%(L)
KM 1080 B%(L)=T9:NEXTK,J
SA 1090 FORKS=1TONC:IS=0:BH=0:
      JS=B%(KS)
KK 1100 MG=SM(IS):X=SX(IS):Y=S
      Y(IS):IFMG=255THENGOTO
      1150
RG 1110 IFMG=6THENCN=X:GOTO114
      0
QD 1120 IFCN=CS(JS)THENBH=1:GO
      SUB750
EG 1130 IFCN<>CS(JS)ANDBH=1THE
      N1150
PR 1140 IS=IS+1:GOTO1100
XA 1150 GOSUB1260:LB$="NAME":X
      =949:GOSUB840:Y=464:GO
      SUB850:G$="":X=989
HF 1160 POKE198,0:WAIT198,1:GE
      TLB$:IFASC(LB$)=13THEN
      1190
DB 1170 IFASC(LB$)=20THENGOSUB
      1250:GOTO1160
JK 1180 GOSUB840:G$=G$+LB$:GOT
      O1160
KE 1190 IFG$=C$(CS(JS))THENLB$
      ="CORRECT":X=910:GOSUB
      840:QZ=QZ+1:GOTO1210
JF 1200 LB$=C$(CS(JS)):X=909:G
      OSUB840:FORI=1TO500:NE
      XTI
QD 1210 GOSUB1260
JM 1220 NEXTKS
PE 1230 PRINT"{CLR}{DOWN}{RVS}
      YOU ANSWERED";QZ;"
      {LEFT} CORRECT OUT OF"
      ;NC;"{LEFT} {OFF}
      {2 DOWN}"
HR 1240 GOSUB500:PRINT"{DOWN}P
      LEASE WAIT":GOSUB550:G
      OTO490
CE 1250 LB$=" ":X=X-1:G$=LEFT$
      (G$,LEN(G$)-1):GOSUB84
      0:X=X-1:RETURN
SX 1260 FORJ=0TO2:S8=31849+J*3
      20:L8=96:N6=S8-1:POKES
      8+L8,0:GOSUB860:NEXTJ:
      RETURN
BP 1270 PRINT"{CLR}":IFAA=4THE
      NPRINT"STARTING ";
CK 1280 PRINT"DATE AND TIME OF
       SKY DISPLAY"
AJ 1290 POKE198,0:INPUT"{DOWN}
      {RVS}MONTH (1-12):
      {OFF}{2 SPACES}1
      {3 LEFT}";MM:IFMM<1ORM
      M>12THEN1290
QQ 1300 INPUT"{RVS}{10 SPACES}
      DAY:{OFF} 1{3 LEFT}";D
      D:IFDD<1ORDD>31THEN130
      0
GF 1310 JD=2446429.5:DA=DD:IFM
      M>1THENFORI=1TOMM-1:DA
      =DA+MO(I):NEXT
QD 1320 JD=JD+DA
FQ 1330 A2=0:AN=0:POKE198,0:IN
      PUT"{DOWN}{RVS}HOUR (0
      -12):{OFF} 9{3 LEFT}";
      A2:B$=" "
MM 1340 IFA2<12THENPRINT"{RVS}
       AM OR PM {OFF}
      {3 SPACES}PM{4 LEFT}";
      :INPUTB$
DJ 1350 IFB$="PM"THENA2=A2+12
PP 1360 TM=A2:AN=(TM-INT(TM))*
      60
DM 1370 POKE198,0:PRINT"{DOWN}
      {RVS}{5 SPACES}LATITUD
      E:{OFF}{3 SPACES}40
      {4 LEFT}";:INPUT LA
CR 1380 FD=TM/24+.5:IFFD=>1THE
      NFD=FD-1:JD=JD+1
SB 1390 DA=DA+FD:D3=JD-2451545
JF 1400 T3=D3/36525:T1=INT(T3)
HH 1410 T2=(JD-T1*36525-245154
      4.5)/36525
```

```
EP 1420 S3=24110.54841+184.812
        866*T1+8640184.812866*
        T2+.093104*T3*T3
MG 1430 S3=(S3-0.0000062*T3*T3
        *T3)/86400:S3=24*(S3-I
        NT(S3)+(FD-.5)*1.00273
        7909)
FM 1440 IFS3<0THENS3=S3+24
BQ 1450 IFS3>24THENS3=S3-24
HS 1460 H3=INT(S3):M3=INT(60*(
        S3-H3))
JG 1470 TG=H3+M3/60
AG 1480 LA=LA*RD
FS 1490 RETURN
RM 1500 DC=DC*RD:RA=RA*15*RD
GA 1510 T5=TG*15*RD-RA
JB 1520 S1=SIN(LA)*SIN(DC)+COS
        (LA)*COS(DC)*COS(T5)
QH 1530 C1=1-S1*S1
DJ 1540 IFC1>0THENC1=SQR(C1)
GH 1550 IFC1<=0THENAL=SGN(S1)*
        ↑/2:GOTO1570
XB 1560 AL=ATN(S1/C1)
RJ 1570 C2=COS(LA)*SIN(DC)-SIN
        (LA)*COS(DC)*COS(T5)
DJ 1580 S2=-COS(DC)*SIN(T5)
AK 1590 IFC2=0THENAZ=SGN(S2)*↑
        /2:GOTO1620
GK 1600 AZ=ATN(S2/C2)
CC 1610 IFC2<0THENAZ=AZ+↑
SD 1620 IFAZ<0THENAZ=AZ+2*↑
CG 1630 PRINT"{CLR}":RETURN
SQ 1640 DATA 19,6,19,6,20,5,21
        ,4,21,3,22,3,21,3,20,4
        ,20,4,19,5,18,5,18,6
FM 1650 REM ML DATA IS IN NEXT
         2 LINES
FE 1660 DATA 169,0,133,251,133
        ,253,169,208,133,252,1
        69,84,133,254,162,16,1
        60,0
CH 1670 DATA 177,251,145,253,1
        36,208,249,230,252,230
        ,254,202,208,240,96
DA 1680 DATA 16,112,480,40,976
        ,152,511,184
XB 1690 DATA31,28,31,30,31,30,
        31,31,30,31,30,31
KC 1700 DATA -1,"POLARIS",2,89
        ,2
EM 1710 DATA -2,"BIG DIPPER"
EA 1720 DATA 11,57,2,11,63,2,1
        1.8,54,2,12.2,58,3,12.
        9,57,2,13.4,55,2,13.7,
        50,2
MD 1730 DATA -3,"ARCTURUS",14.
        3,19.5,1
FP 1740 DATA -4,"VIRGO",13.4,-
        11,1,12.6,-1,3,12.9,3,
        3,13,11,3
QG 1750 DATA -5,"PEGASUS",0.2,
        15,3,23,14,2,23,28,2,.
        1,29,2
EP 1760 DATA -6,"AURIGA",5.2,4
        6,1,5.9,45,2,5.9,37,2,
        4.9,33,3,5.4,29,2
XS 1770 DATA -7,"ORION",5.9,8,
        1,5.4,7,2,5.75,-2,2,5.
        6,-1,2,5.45,0,2
HM 1780 DATA 5.6,-5.5,4,5.2,-8
        .5,1,5.8,-10,2
HB 1790 DATA -8,"VEGA",18.6,39
        ,1,-9,"CYGNUS"
BX 1800 DATA 20.7,45,1,20.3,40
        ,2,19.7,45,3,20.75,34,
        2,19.5,28,3,19.9,35,4
DX 1810 DATA -10,"CANIS MAJOR"
        ,6.7,-17,1,6.4,-18,2
QA 1820 DATA-11,"AQUILA",19.8,
        9,1,19.1,13.5,3,20.1,-
        1,3,19.4,3,3,19.1,-5,3
XS 1830 DATA -12,"SCORPIUS",16
        .5,-26,1,16,-20,2,15.9
        ,-22,2,15.9,-26,3
EM 1840 DATA 17.6,-43,2,16.7,-
        34,2,17.6,-37,2,16.7,-
        38,3,17.2,-43,3
JK 1850 DATA -13,"CASSIOPEIA",
        1.9,63.5,4,1.4,60,3,0.
        9,60.5,2,0.6,56,2,0.1,
        59,2
QX 1860 DATA -14,"TAURUS",4.6,
        16,1,4.2,15,4,4.4,19,3
RG 1870 DATA -15,"CANIS MINOR"
        ,7.6,6,1,7.4,9,3
HQ 1880 DATA -16,"GEMINI",7.5,
        32,1,7.7,28,1,6.7,25,3
        ,6.6,16,2,6.3,22,3
SJ 1890 DATA -17,"LEO"
XE 1900 DATA10.1,12.5,1,10.1,1
        7,3,10.3,20,2,10.3,24,
        3,9.8,26,4,9.7,24,3
GQ 1910 DATA 11.2,21,2,11.2,16
        ,3,11.8,15,2
BD 1920 DATA-18,"SAGITTARIUS",
        18.3,-30,3,18,-30.5,3,
        18.4,-25,3,18.9,-26,2,
        19,-30,2
QA 1930 DATA 18.7,-27,3,19.1,-
        28,3,18.3,-34.5,2
HF 1940 DATA -19,"FOMALHAUT",2
        2.9,-30,1
PS 1950 DATA-20,"CARINA",6.4,-
        52,1
JS 1960 DATA8.4,-59,2,9.2,-59,
        2,9.2,-69,2,9.8,-65,3
SS 1970 DATA-21,"VELA",8.2,-47
        ,2,8.6,-54,2,9.1,-43,2
        ,9.3,-55,2
KD 1980 DATA-22,"CRUX",12.1,-5
        8,2,12.4,-63,1,12.5,-5
        6,1,12.8,-59,1
QF 1990 DATA-23,"CENTAURUS",14
        .6,-61,1,14,-60,1
PS 2000 DATA-24,"ACHERNAR",1.6
        ,-58,1,0
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," elsewhere in this issue.

Animator 64

Article on page 86.

Program 1: Animator 64

```
KC 10 REM COPYRIGHT 1987 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
KF 20 IFLL=1THENLL=0:GOTO220
PM 30 POKE55,0:POKE56,72:CLR
PE 40 OPEN1,0,0
JR 50 POKE53280,6:POKE53281,0
ER 60 PRINT"{WHT}{CLR}
      {3 SPACES}COPYRIGHT 1987
       COMPUTE! PUB., INC."CHR
      $(142)CHR$(8)
GH 70 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED"
AM 80 FORI=679TO765:READA:X=X+
      A:POKEI,A:NEXT
EX 90 IFX<>9869THENPRINT"
      {DOWN}ERROR IN DATA STAT
      EMENT.":STOP
GS 100 DATA 169,0,160,0,162,0,
       173,0,6,141,0,8,173,0,3
       6,141,0,220,238,174
JG 110 DATA 2,173,174,2,201,0,
       208,3,238,175,2,238,177
       ,2,173,177,2,201,0
XM 120 DATA 208,3,238,178,2,23
       8,180,2,173,180,2,201,0
       ,208,3,238,181,2,238
DR 130 DATA 183,2,173,183,2,20
       1,0,208,3,238,184,2
MP 140 DATA 232,224,128,240,3,
       76,173,2,200,192,8,240,
       3,76,171,2,96
JX 150 DIM PO(10,2)
RH 160 FORR=1TO10:PA(R)=50:NEX
       TR:PRINT"{CLR}"
JQ 170 BG=1:NU=9:BF=1
BH 180 FORR=0TO9:PO(R,1)=18432
       +R*2048:PO(R,2)=PO(R,1)
       +1024
DG 190 PO(R,1)=PO(R,1)/256:PO(
       R,2)=PO(R,2)/256:NEXTR
MC 200 FORR=0TO9:POKE687,4:POK
       E693,4:POKE690,(18432+2
       048*R)/256
XX 210 POKE696,(18432+1024+204
       8*R)/256:SYS679:NEXTR
BK 220 PRINT"{CLR}{7 DOWN}
       {WHT}":IFBG=2THENPRINT"
       {BLK}";
XH 230 PRINT"ANIMATOR 64:
       {DOWN}"
ME 240 PRINT"0-9) EDIT SCREEN
       {8 SPACES}D)ISPLAY"
AM 250 PRINT"C)OPY SCREEN
       {12 SPACES}P)ARAMETERS"
MK 260 PRINT"S)AVE TO DISK
       {11 SPACES}L)OAD FROM D
       ISK"
JH 270 PRINT"E)XIT PROGRAM"
JE 280 PRINT "{DOWN}
       {10 SPACES}CHOICE?";
AC 290 GETA$:A=VAL(A$)
EB 300 IFA$=""THEN290
EK 310 ON-(A$="D")-(A$="C")*2-
       (A$="P")*3GOTO350,460,5
       70
EM 320 ON-(A$="S")-(A$="E")*2-
       (A$="0"ORA<>0)*3GOTO700
       ,840,880
PE 330 ON-(A$="L")GOTO940
GP 340 GOTO290
HD 350 FORR=1TO500:NEXTR:UB=1
HX 360 IFUB=-1ANDBF=1THENFORLO
       =NU-1TO1STEP-1:GOTO380
AP 370 FORLO=0TONU
MG 380 XX=LO:GOSUB1100
KE 390 FORPA=1TOPA(XX):NEXTPA
AP 400 GETA$:IFA$<>" "ANDA$<>C
       HR$(13)THEN430
CG 410 IFA$=" "THENGOSUB440:GO
       TO430
JQ 420 GOTO220
FE 430 NEXTLO:UB=-UB:GOTO360
JB 440 GETA$:IFA$=""THEN440
FC 450 RETURN
MK 460 X=CR:X1=CR+1:IFX1=10THE
       NX1=0
FB 470 X2=X1:PRINT"{CLR}
       {2 DOWN}COPY SCREEN:
       {DOWN}"
RX 480 PRINT"COPY SCREEN # "X"
       {4 LEFT}";:INPUTC1
GB 490 PRINT"TO:{2 SPACES}SCRE
       ENS{2 SPACES}"X1"
       {4 LEFT}";:INPUTC2
GC 500 PRINT"{5 SPACES}THROUGH
       {2 SPACES}"X2"{4 LEFT}"
       ;:INPUTC3
HP 510 FORR=C2TOC3
KQ 520 POKE687,PO(C1,1):POKE69
       3,PO(C1,2)
GG 530 POKE690,PO(R,1):POKE696
       ,PO(R,2)
MH 540 SYS679
```

```
SR 550 NEXTR
EF 560 GOTO220
GB 570 PRINT"{CLR}{2 DOWN}PARA
       METERS:{DOWN}"
EK 580 FORR=0TO9:A$="PAUSE":IF
       R<>10THENA$=A$+" "
EC 590 A$=A$+STR$(R)+"
       {4 SPACES}: "+STR$(PA(R
       )):PRINTA$:NEXTR:PRINT
QQ 600 PRINT"BACKGROUND
       {2 SPACES}(1-16): "BG
SR 610 PRINT"HI SCREEN #
       {2 SPACES}(0-9): "NU
QM 620 PRINT"BACK/FORWARD (0/1
       ): "BF
ME 630 PRINT"{HOME}{4 DOWN}";:
       MO$="{19 RIGHT}"
GA 640 FORR=0TO9:PRINTMO$;:INP
       UTPA(R):NEXTR
SR 650 PRINT:PRINTMO$;:INPUTBG
       :IFBG<1ORBG>16THEN570
HB 660 PRINTMO$;:INPUTNU:IFNU<
       0ORNU>9THEN570
XM 670 PRINTMO$;:INPUTBF:IFBF<
       >0ANDBF<>1THEN570
BF 680 POKE53280,BG-1:POKE5328
       1,BG-1
PS 690 GOTO220
AJ 700 PRINT"{CLR}{DOWN}SAVE S
       CREENS TO DISK:"
GJ 710 PRINT"FILENAME TO SAVE?
       "
BG 720 PRINT"("CHR$(34)"EXIT"C
       HR$(34)" TO ABORT)"
ED 730 PRINT:PRINT">";:INPUT#1
       ,FI$
AE 740 IFFI$="EXIT"THEN220
DK 750 PRINT:PRINT:PRINT"** PL
       EASE STANDBY **"
XF 760 F1$=FI$+".DAT,S,W":F2$=
       FI$+".SCR":F3$="S0:"+F2
       $
RE 770 OPEN15,8,15,"S0:"+F1$:C
       LOSE15:OPEN2,8,2,"0:"+F
       1$
HS 780 PRINT#2,BG:PRINT#2,BF:P
       RINT#2,NU
BP 790 FORR=1TO10:PRINT#2,PA(R
       ):NEXTR
HR 800 CLOSE2
MA 810 OPEN15,8,15,F3$:CLOSE15
FP 820 SYS57812F2$,8:POKE193,0
       :POKE194,72:POKE174,0:P
       OKE175,152:SYS62954
DA 830 PRINT:PRINT"SAVED ...":
       FORR=1TO1000:NEXTR:GOTO
       220
EP 840 PRINT"{CLR}{2 DOWN}ARE
       {SPACE}YOU SURE?"
DP 850 GETA$:IFA$=""ORA$<>"Y"A
       NDA$<>"N"THEN850
JR 860 IFA$="N"THEN220
GQ 870 END
EH 880 PRINT"{HOME}";:XX=A:CR=
       XX:GOSUB1100
MD 890 INPUT#1,BL$
KJ 900 GETA$:IFA$="A"THEN220
RM 910 IFA$<>CHR$(13)THEN900
CS 920 GOSUB1070
PR 930 GOTO220
JM 940 PRINT"{CLR}{2 DOWN}LOAD
        FROM DISK:{DOWN}"
FB 950 PRINT"FILENAME TO LOAD?
       "
EF 960 PRINT"("CHR$(34)"EXIT"C
       HR$(34)" TO ABORT)
       {DOWN}"
MH 970 PRINT">";:INPUT#1,FI$
MP 980 IFFI$="EXIT"THEN220
JJ 990 PRINT:PRINT:PRINT"** PL
       EASE STANDBY **"
BP 1000 F1$=FI$+".DAT,S,R":F2$
       =FI$+".SCR"
CC 1010 OPEN2,8,2,F1$
BK 1020 INPUT#2,BG:INPUT#2,BF:
       INPUT#2,NU
XG 1030 FORR=1TO10:INPUT#2,PA(
       R):NEXTR:CLOSE2
QH 1040 POKE53281,BG-1:POKE532
       80,BG-1
QG 1050 LL=1:LOADF2$,8,1
PC 1060 END
HR 1070 POKE687,1024/256:POKE6
       93,55296/256
JE 1080 POKE690,PO(XX,1):POKE6
       96,PO(XX,2)
GS 1090 SYS679:RETURN
PC 1100 POKE690,1024/256:POKE6
       96,55296/256
SE 1110 POKE687,PO(XX,1):POKE6
       93,PO(XX,2)
PX 1120 SYS679:RETURN
```

Program 2: Animator Booter

```
PM 10 IFLL=1THEN260
XS 20 S1$=" ":REM ANIMATOR DAT
      A FILENAME
FK 30 S2$=" ":REM PROGRAM NAME
       TO BOOT
XF 40 S3$=" ":REM COMMAND TO R
      UN PROGRAM
JH 50 DIMPO(10,2)
QX 60 FORR=0TO9:PO(R,1)=18432+
      (R*2048):PO(R,2)=PO(R,1)
      +1024
QR 70 PO(R,1)=PO(R,1)/256:PO(R
      ,2)=PO(R,2)/256:NEXTR
MR 80 PO=679
AJ 90 READA:IFA=-1THEN170
GM 100 POKEPO,A:PO=PO+1:SU=SU+
       A
MR 110 GOTO90
SR 120 DATA 169,0,160,0,162,0,
       173,0,6,141,0,8,173,0,3
       6,141,0,220,238,174
AH 130 DATA 2,173,174,2,201,0,
       208,3,238,175,2,238,177
       ,2,173,177,2,201,0
HE 140 DATA 208,3,238,178,2,23
       8,180,2,173,180,2,201,0
       ,208,3,238,181,2,238
PS 150 DATA 183,2,173,183,2,20
       1,0,208,3,238,184,2
HH 160 DATA 232,224,128,240,3,
       76,173,2,200,192,8,240,
       3,76,171,2,96,-1
JR 170 IFSU<>9869THENPRINT"
       {CLR}{2 DOWN}ERROR IN D
       ATA{DOWN}":STOP
MM 180 FI$=S1$
GM 190 PRINT:PRINT:PRINT"{CLR}
       {DOWN}** PLEASE STANDBY
       **"
CK 200 F1$=FI$+".DAT,S,R":F2$=
       FI$+".SCR"
EC 210 OPEN2,8,2,F1$
GE 220 INPUT#2,BG:INPUT#2,BF:I
       NPUT#2,NU
EB 230 FORR=1TO10:INPUT#2,PA(R
       ):NEXTR:CLOSE2
AC 240 POKE53281,BG-1:POKE5328
       0,BG-1
HK 250 LL=1:LOADF2$,8,1
JK 260 GETA$:GETA$
EE 270 FORR=1TO500:NEXTR:UB=1
SQ 280 IFUB=-1ANDBF=1THENFORLO
       =NU-1TO1STEP-1:GOTO300
RH 290 FORLO=0TONU
QX 300 XX=LO:GOSUB340
SS 310 FORPA=1TOPA(XX):NEXTPA
QS 320 GETA$:IFA$<>""THEN370
HJ 330 NEXTLO:UB=-UB:GOTO280
MR 340 POKE690,1024/256:POKE69
       6,55296/256
XF 350 POKE687,PO(XX,1):POKE69
       3,PO(XX,2)
PE 360 SYS679:RETURN
DK 370 PRINT"{CLR}{2 DOWN}
       {WHT}BOOTING MAIN PROGR
       AM...":POKE53280,0:POKE
       53281,0
PX 380 LI$="{HOME}{BLK}
       {7 DOWN}LOAD"+CHR$(34)+
       S2$+CHR$(34)+",8,1
       {5 DOWN}"+S3$+"{HOME}
       {3 DOWN}"
XE 390 PRINTLI$:POKE631,13:POK
       E632,13:POKE198,2:STOP
```

BEFORE TYPING . . .

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Number, Please?

Article on page 71.

```
KC 10 REM COPYRIGHT 1987 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
BM 20 IFPEEK(65530)=5THENBANK1
      5
MG 30 X=RND(-TI):GOTO170
CB 40 POKEN(I,J),NN(I,J)+48:PO
      KEN(I,J)+C,1:RETURN
HM 50 POKES(K),SP(SS(K)):POKES
      (K)+C,4:RETURN
XP 60 IFV=0THENFL=1:RETURN
KS 70 ONR+1GOTO80,90,100,110
XE 80 W=U+V:RETURN
JH 90 W=U-V:RETURN
KE 100 W=U*V:RETURN
MP 110 W=U/V:RETURN
JH 120 PRINT"{HOME}":FORI=0TO1
       7:PRINT:NEXT:PRINT"
       {33 SPACES}"
MD 130 FORI=SC+644TOSC+671STEP
       3:POKEI,32:NEXT:RETURN
CC 140 FL=1:FORI=0TO2:FORJ=0TO
       2
DR 150 IFNN(I,J)+48<>PEEK(N(I,
       J))THENFL=0
HM 160 NEXT:NEXT:RETURN
CA 170 PRINTCHR$(14)CHR$(8)"
       {CLR}{PUR}{3 SPACES}COP
       YRIGHT 1987 COMPUTE! PU
       B., INC."
JP 180 PRINTTAB(11)"ALL RIGHTS
        RESERVED":Q=646:BO=532
       80:BA=53281:SC=1024:C=5
       4272
BB 190 IFPEEK(65530)=164THENQ=
       1339:BO=65305:BA=65301:
       SC=3072:C=-1024
RR 200 IFPEEK(65530)=5THENQ=24
       1
AS 210 Z=40:POKEBO,0:POKEBA,0
GF 220 DIMN(3,3),NN(3,3),S(12)
       ,SS(12),SP(4),D(3,3),DD
       (3,3),O(10),OO(3,3)
XG 230 DEFFNB(I)=INT(RND(1)*I)
FF 240 FORI=0TO2:FORJ=0TO2:N(I
       ,J)=SC+94+J*4+I*Z*4:NEX
       T:NEXT
EJ 250 FORI=0TO3:READSP(I):NEX
       T
JF 260 FORI=0TO11:READJ:S(I)=S
       C+J:NEXT
GX 270 FORI=0TO5:READJ:X(I)=SC
       +J:NEXT
```

```
FK 280 FORI=1TO7:READAB(I):NEX
       T
PJ 290 PRINT"{CLR}{HOME}{CYN}"
MB 300 PRINTTAB(13)"{A}*{R}*
       {R}*{R}*{R}*{S}"
DE 310 PRINTTAB(13)"- - - - -
       {SPACE}-{2 SPACES}-"
RX 320 PRINTTAB(13)"{Q}*+*+*+*
       +*+**{X}
QQ 330 PRINTTAB(13)"- -{RVS}
       {OFF}-{SHIFT-SPACE}-
       {RVS} {OFF}- -"
QC 340 PRINTTAB(13)"{Q}*+*+*+*
       +*+**{S}
DH 350 PRINTTAB(13)"- - - - -
       {SPACE}-{2 SPACES}-"
QC 360 PRINTTAB(13)"{Q}*+*+*+*
       +*+**{X}
QK 370 PRINTTAB(13)"- -{RVS}
       {OFF}-{SHIFT-SPACE}-
       {RVS} {OFF}- -"
QH 380 PRINTTAB(13)"{Q}*+*+*+*
       +*+**{S}
DC 390 PRINTTAB(13)"- - - - -
       {SPACE}-{2 SPACES}-"
KX 400 PRINTTAB(13)"{Q}*{E}{R}
       +*{E}{R}+*{E}{R}*{X}
MR 410 PRINTTAB(13)"-
       {2 SPACES}--{2 SPACES}-
       -{2 SPACES}-
RB 420 PRINTTAB(13)"{Z}**{X}
       {Z}**{X}{Z}**{X}"
BC 430 PRINT"{HOME}":FORI=0TO2
       0:PRINT:NEXT:PRINTTAB(1
       5)"{YEL}LEVEL? (0-3)";
QS 440 GETA$:IFA$<"0"ORA$>"3"T
       HEN440
AQ 450 G=VAL(A$)
QP 460 PRINT"{7 LEFT} ";A$;"
       {9 SPACES}"
HK 470 FORI=0TO2:FORJ=0TO2:NN(
       I,J)=FNB(9)+1:POKEN(I,J
       )+C,2:NEXT:NEXT
SM 480 K=0:FORI=0TO2:D(I,0)=NN
       (I,0)
AF 490 FORJ=0TO1
XX 500 SS(K)=FNB(4)
JE 510 R=SS(K):U=D(I,J):V=NN(I
       ,J+1):GOSUB60
HP 520 IFFLTHENFL=0:GOTO500
PM 530 D(I,J+1)=W:IFW<1ORW<>IN
       T(W)THEN500
SD 540 GOSUB50:K=K+1:NEXTJ:E(I
       )=W:NEXTI
SQ 550 FORJ=0TO2:DD(0,J)=NN(0,
       J)
GK 560 FORI=0TO1
MC 570 SS(K)=FNB(4)
MR 580 R=SS(K):U=DD(I,J):V=NN(
       I+1,J):GOSUB60
HJ 590 DD(I+1,J)=W:IFW<1ORW<>I
       NT(W)THEN570
XM 600 IFFLTHENFL=0:GOTO570
DF 610 GOSUB50
AG 620 K=K+1
SF 630 NEXTI:E(J+3)=W:NEXTJ
FX 640 FORI=0TO5:IFE(I)>99THEN
       480
RM 650 NEXT
KM 660 FORI=0TO5:E$(I)=RIGHT$(
       STR$(E(I)),2):NEXT
JS 670 FORI=0TO5:FORJ=0TO1
SQ 680 POKEX(I)+J,ASC(MID$(E$(
       I),J+1,1)):POKEX(I)+J+C
       ,3
GR 690 NEXT:NEXT
SK 700 FORI=1TO9:O(I)=0:NEXT
KX 710 FORI=0TO2:FORJ=0TO2
GB 720 RA=FNB(9)+1:IFO(RA)THEN
       720
AG 730 POKESC+644+RA*3,NN(I,J)
       +48:O(RA)=1
BS 740 NEXT:NEXT
KH 750 IFG=0THEN840
GK 760 FORI=0TO2:FORJ=0TO2:OO(
       I,J)=0:NEXT:NEXT
XH 770 FORI=1TOG
SE 780 RA=FNB(3):RB=FNB(3):IFO
       O(RA,RB)THEN780
XX 790 POKEN(RA,RB),NN(RA,RB)+
       48:POKEN(RA,RB)+C,1:OO(
       RA,RB)=1
MX 800 Y=0
XE 810 HJ=SC+644+Y:IFPEEK(HJ)=
       NN(RA,RB)+48THENPOKEHJ,
       32:GOTO830
DQ 820 Y=Y+3:GOTO810
CF 830 NEXT
MP 840 FORI=0TO34:POKESC+644+I
       +C,1:NEXT
PA 850 I=0:J=0:H=0:L=1
JF 860 POKEN(I,J),PEEK(N(I,J))
       +128
DH 870 POKEQ,AB(L):PRINT"
       {HOME}{5 DOWN}"
KS 880 PRINTTAB(3)"NUMBER"SPC(
       22)"PLEASE?"
FC 890 L=L+1:IFL>7THENL=1
RF 900 FORT=0TO30:NEXT
PX 910 POKEN(I,J),PEEK(N(I,J))
       -128
FP 920 FORT=0TO30:NEXT
FJ 930 GETA$:IFA$=""THEN860
PD 940 IFA$=CHR$(13)THENH=1:GO
       SUB140:IFFLTHEN1080
DX 950 IFHTHENH=0:GOTO1130
PM 960 IFA$=CHR$(32)THEN1060
EC 970 IFA$<"1"ORA$>"9"THEN860
KG 980 FORK=SC+644TOSC+671STEP
       3:IFPEEK(K)=ASC(A$)THEN
       1000
EH 990 NEXT:GOTO860
MH 1000 MM=PEEK(N(I,J)+C)AND15
       :IFMM=1THEN860
XE 1010 POKEK,32
FH 1020 M=PEEK(N(I,J)):IFM=32T
       HEN1040
CF 1030 RA=FNB(9):K=SC+644+3*R
       A:IFPEEK(K)<>32THEN103
       0
DF 1040 POKEK,M
BP 1050 POKEN(I,J),ASC(A$)
FH 1060 J=J+1:IFJ>2THENJ=0:I=I
       +1:IFI>2THENI=0:J=0
HK 1070 L=1:GOTO860
RE 1080 PRINT"{HOME}":FORI=0TO
       17:PRINT:NEXT:PRINTTAB
       (8)"{7}CORRECT! PLAY A
       GAIN?"
GB 1090 GETA$:IFA$=""THEN1090
RS 1100 GOSUB120
EF 1110 IFA$<>"N"THEN290
GQ 1120 PRINT"{CLR}":END
QJ 1130 PRINT"{HOME}":FORI=0TO
       17:PRINT:NEXT:PRINTTAB
       (9)"{7}INCORRECT. SAME
        PUZZLE?"
CF 1140 GETA$:IFA$=""THEN1140
DM 1150 IFA$<>"Y"THEN1220
SF 1160 GOSUB120
AK 1170 K=0:FORI=0TO2:FORJ=0TO
       2
GK 1180 IF(PEEK(N(I,J)+C)AND15
       )=1THEN1200
XJ 1190 POKESC+644+3*K,NN(I,J)
       +48:POKEN(I,J),32
GK 1200 K=K+1
AM 1210 NEXT:NEXT:GOTO850
HC 1220 PRINTTAB(9)"{UP}
       {4 SPACES}PRESS SPACE
       {SPACE}BAR{7 SPACES}"
FS 1230 FORI=0TO2:FORJ=0TO2
QX 1240 POKEN(I,J),NN(I,J)+48:
       NEXT:NEXT
AX 1250 GETA$:IFA$=""THEN1250
PB 1260 GOSUB120:GOTO290
QC 1270 GOTO1270
RG 1280 DATA43,45,24,47
MG 1290 DATA96,100,256,260,416
       ,420
FA 1300 DATA174,334,178,338,18
       2,342
QJ 1310 DATA104,264,424,494,49
       8,502
JB 1320 DATA11,12,15,1,15,12,1
       1
```

Schnip

See instructions in article on page 65 before typing in.

```
C000:A9 00 8D 8C CD A9 06 8D 7F
C008:21 D0 A9 00 8D 20 D0 A9 BB
C010:00 85 C6 A9 37 8D C7 CD B3
C018:A9 37 8D CA CD A9 DB 8D F4
C020:C8 CD A9 00 8D C9 CD A9 87
C028:20 8D CB CD A9 FF 8D CC A8
C030:CD AD 1C D0 09 03 8D 1C 20
C038:D0 A9 03 8D 82 CD A9 FF 64
C040:8D 83 CD A9 00 A0 00 99 D9
C048:D0 CF C8 C0 0A D0 F8 A9 7A
C050:00 A0 00 99 40 CE C8 C0 23
C058:C8 D0 F8 AD 8C CD D0 0C B5
C060:A9 00 A2 00 9D DC CD E8 EF
C068:E0 1E D0 F8 A9 93 20 D2 3A
C070:FF A9 00 A0 00 99 00 D4 A1
C078:C8 C0 17 D0 F8 A9 0F 8D 98
C080:18 D4 A9 08 8D 03 D4 A9 C4
C088:00 8D 05 D4 A9 F0 8D 06 8D
C090:D4 A9 2F 8D 00 D4 A9 37 83
C098:8D 01 D4 A9 00 8D A4 CE A4
C0A0:8D 41 CE 8D 42 CE A9 04 90
C0A8:8D 40 CE A9 FF 8D A5 CE C5
C0B0:A9 0D 8D F8 07 A9 0E 8D 14
C0B8:F9 07 A9 0F 8D FA 07 AD 33
C0C0:1D D0 09 03 8D 1D D0 A9 82
C0C8:0A 8D 25 D0 A9 09 8D 26 17
C0D0:D0 A9 01 8D 28 D0 A9 00 F5
C0D8:8D 27 D0 A9 07 8D 29 D0 31
C0E0:A0 00 B9 EA C8 99 40 03 C8
C0E8:C8 C0 C0 D0 F5 AD 8C CD 71
C0F0:D0 03 20 B4 C4 A9 78 8D 36
C0F8:05 D0 8D 04 D0 A9 00 8D DD
C100:8C CD A9 FA 8D 35 CD 8D 8C
C108:34 CD A9 00 8D 8D CD 20 AC
C110:0C C6 20 27 C7 20 6A C5 1B
C118:20 8C C8 A9 64 8D 00 D0 AC
C120:A9 00 8D 10 D0 A9 07 8D F3
C128:15 D0 A9 E1 8D 02 D0 A9 7D
C130:D7 8D 03 D0 8D 01 D0 A9 2C
C138:00 8D 3C CD 20 96 C1 20 82
C140:B4 C3 AD 8D CD D0 C3 4C 23
C148:08 C2 AD 08 CF C9 28 10 BC
C150:0D AD 0A CF C9 28 10 22 35
C158:20 42 C3 4C 3F C1 A9 00 0E
C160:8D 08 CF AD F8 07 C9 0D 06
C168:F0 08 A9 0D 8D F8 07 4C 17
C170:51 C1 A9 0E 8D F8 07 4C CD
C178:51 C1 A9 00 8D 0A CF AD 2C
C180:F9 07 C9 0D F0 08 A9 0D D4
C188:8D F9 07 4C 58 C1 A9 0E 22
C190:8D F9 07 4C 58 C1 AD 04 28
C198:D0 C9 E1 F0 04 C9 78 F0 6B
C1A0:08 AD 00 DC C9 6F D0 EE FD
C1A8:60 AD 01 DC C9 EF D0 E6 4C
C1B0:60 AD 82 CD 8D AD 02 AD D1
C1B8:83 CD 8D AE 02 CE AD 02 B6
C1C0:D0 01 60 CE AE 02 D0 FB 01
C1C8:AD 83 CD 8D AE 02 4C BD 6A
C1D0:C1 BD 01 D0 CD C7 CD F0 EB
C1D8:09 DE 01 D0 FE 08 CF 4C C9
C1E0:E2 C1 4C 6C C2 BD 01 D0 76
C1E8:CD C8 CD F0 7F FE 01 D0 19
C1F0:FE 08 CF 4C 6C C2 20 D1 35
```

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C1F8:C1 20 6D C2 4C 6C C2 20 F8
C200:E5 C1 20 6D C2 4C 6C C2 A6
C208:A9 01 8D 3C 03 A2 00 AD 68
C210:00 DC 20 25 C2 A9 02 8D 71
C218:3C 03 A2 02 AD 01 DC 20 3C
C220:25 C2 4C 4A C1 85 05 A5 EA
C228:05 29 1F 49 1F 85 02 AD B3
C230:01 DC 85 06 A5 06 49 FF 56
C238:85 03 05 02 85 04 A5 04 8D
C240:C9 00 F0 28 A5 04 C9 00 1C
C248:F0 22 A5 02 C9 01 F0 81 59
C250:C9 02 F0 91 C9 08 F0 15 D7
C258:C9 04 F0 40 C9 09 F0 96 D0
C260:C9 0A F0 9B C9 06 F0 20 8D
C268:C9 05 F0 4B 60 20 0D C3 48
C270:AD 13 CF C9 01 F0 14 BD D9
C278:00 D0 CD CC CD F0 4C FE 82
C280:00 D0 FE 08 CF 4C 6C C2 E5
C288:4C FB C2 BD 00 D0 CD CA 11
C290:CD F0 D9 FE 00 D0 FE 08 AD
C298:CF 4C 6C C2 20 0D C3 AD 3D
C2A0:13 CF C9 01 D0 14 BD 00 3F
C2A8:D0 CD C9 CD F0 31 DE 00 2A
C2B0:D0 FE 08 CF 4C 6C C2 4C 42
C2B8:04 C3 BD 00 D0 CD CB CD 0C
C2C0:F0 AA DE 00 D0 FE 08 CF A7
C2C8:4C 6C C2 AD 10 D0 0D 3C DC
C2D0:03 8D 10 D0 A9 00 9D 00 D2
C2D8:D0 FE 08 CF 4C 6C C2 A9 C7
C2E0:FF ED 3C 03 8D 3C 03 AD AA
C2E8:10 D0 2D 3C 03 8D 10 D0 53
C2F0:A9 FF 9D 00 D0 FE 08 CF 61
C2F8:4C 6C C2 20 E5 C1 20 9C 2D
C300:C2 4C 6C C2 20 D1 C1 20 A1
C308:9C C2 4C 6C C2 8A 8D 12 4C
C310:CF AD 12 CF C9 00 F0 05 5F
C318:C9 02 F0 0F 60 AD 10 D0 BE
C320:4A B0 17 A9 00 8D 13 CF A2
C328:4C 1C C3 AD 10 D0 4A 4A D2
C330:B0 08 A9 00 8D 13 CF 4C EB
C338:1C C3 A9 01 8D 13 CF 4C A8
C340:1C C3 AD 1E D0 8D 3D CD 63
C348:AD 3D CD 4A 4A 4A B0 01 32
C350:60 AD 3D CD 4A B0 0A AD CE
C358:3D CD 4A 4A B0 1E 4C 50 C6
C360:C3 A9 01 8D 29 D0 20 56 50
C368:C8 AD 04 D0 E9 0A 8D 46 26
C370:CD AD 00 D0 CD 46 CD 10 8A
C378:1E 4C A0 C3 A9 00 8D 29 04
C380:D0 20 56 C8 AD 04 D0 E9 D8
C388:0A 8D 46 CD AD 02 D0 CD 03
C390:46 CD 10 03 4C A0 C3 EE 3C
C398:04 D0 EE 04 D0 4C A6 C3 3D
C3A0:CE 04 D0 CE 04 D0 A9 01 4F
C3A8:8D 38 CD CE 05 D0 CE 05 B9
C3B0:D0 4C 50 C3 20 B1 C1 AD F2
C3B8:05 D0 8D 33 CD AD 04 D0 D9
C3C0:8D 32 CD AD 35 CD CD 33 DF
C3C8:CD 30 20 4C E5 C3 AD 34 D9
C3D0:CD CD 32 CD 30 03 4C DF DB
C3D8:C3 20 FE C3 4C FD C3 20 68
C3E0:2C C4 4C FD C3 20 5A C4 31
C3E8:4C CE C3 20 74 C4 AD 3C 13
C3F0:CD C9 01 F0 03 4C CE C3 AB
C3F8:A9 01 8D 8D CD 60 AD 04 6F
C400:D0 C9 FF F0 07 C9 49 F0 56
C408:13 4C 7E C4 AD 10 D0 09 A2
C410:04 8D 10 D0 A9 00 8D 04 7A
C418:D0 4C 7E C4 AD 10 D0 4A D2
C420:4A 4A B0 66 A9 00 8D 37 7D
C428:CD 4C 7E C4 AD 04 D0 C9 B0
C430:00 F0 07 C9 10 F0 13 4C 2A
C438:8A C4 AD 10 D0 29 FB 8D 9F
C440:10 D0 A9 FF 8D 04 D0 4C A5
C448:8A C4 AD 10 D0 4A 4A 4A 8D
C450:B0 38 A9 00 8D 37 CD 4C A6
C458:7E C4 AD 05 D0 C9 2D F0 51
C460:03 4C A2 C4 A9 00 8D 38 BF
C468:CD 4C 96 C4 A9 01 8D 38 AF
C470:CD 4C A2 C4 AD 05 D0 C9 81
C478:E8 F0 31 4C 96 C4 AD 32 F2
C480:CD 8D 34 CD EE 04 D0 4C 2D
C488:AB C4 AD 32 CD 8D 34 CD CC
C490:CE 04 D0 4C AB C4 AD 33 60
C498:CD 8D 35 CD EE 05 D0 4C 69
C4A0:AB C4 AD 33 CD 8D 35 CD F6
C4A8:CE 05 D0 60 A9 01 8D 3C A3
C4B0:CD 4C AB C4 A9 02 8D DA 41
C4B8:CF A9 00 85 FE 85 FD 8D 84
C4C0:2C CE 8D 29 CE 8D 2D CE 2E
C4C8:A9 08 85 FB EE 2D CE AD 11
C4D0:2D CE C9 03 F0 65 A9 93 12
C4D8:20 D2 FF A2 02 A0 0E 18 18
C4E0:20 F0 FF A9 80 A0 CA 20 8D
C4E8:1E AB A2 04 A0 03 18 20 62
C4F0:F0 FF A9 8D A0 CA 20 1E 8F
C4F8:AB A2 06 A0 0B 18 20 F0 B5
C500:FF A9 B1 A0 CA 20 1E AB F4
C508:20 43 C5 EE 2C CE A9 00 0C
C510:85 FE 20 CF FF C9 0D F0 51
C518:17 A6 FE E6 FE 29 3F 9D DF
C520:9A 05 A4 FD C4 FB F0 05 AB
C528:E6 FD 99 DC CD 4C 12 C5 31
C530:A9 18 85 FB A9 0F 85 FD 99
C538:4C CC C4 A9 93 20 D2 FF 13
C540:4C 0B C6 A2 0A A0 0A 18 B6
C548:20 F0 FF A9 AA A0 C9 20 46
C550:1E AB AD 2C CE 69 30 8D 58
C558:A2 05 A9 00 8D A2 D9 A2 F8
C560:0D A0 0A 18 20 F0 FF 4C 6E
C568:0B C6 A2 18 A0 00 18 20 56
C570:F0 FF A9 BD A0 C9 20 1E 10
C578:AB A9 00 8D E7 DB A9 A0 BF
C580:8D E7 07 A2 18 A0 02 18 37
C588:20 F0 FF A9 B2 A0 C9 20 C6
C590:1E AB A9 00 8D 79 CD 8D C6
C598:7A CD A9 FF 8D 7B CD AD AD
C5A0:7B CD 8D 78 CD AD 79 CD 7C
C5A8:CD DA CF F0 5E EE 78 CD 48
C5B0:AC 78 CD B9 DC CD C9 00 B7
C5B8:F0 0D 69 7F 99 CA 07 A9 D4
C5C0:00 99 CA DB 4C AD C5 EE 5D
C5C8:78 CD EE 78 CD EE 7A CD 56
C5D0:AC 7A CD B9 D0 CF AC 78 3E
C5D8:CD 69 7F 69 30 99 CA 07 B0
C5E0:A9 00 99 CA DB EE 78 CD 7A
C5E8:EE 7A CD AC 7A CD B9 D0 5E
C5F0:CF AC 78 CD 69 7F 69 31 C8
C5F8:99 CA 07 A9 00 99 CA DB 57
C600:A9 0E 8D 7B CD EE 79 CD 3A
C608:4C 9F C5 60 EA AD 29 D0 93
C610:29 0F C9 00 F0 34 C9 01 1C
C618:F0 09 A9 78 8D 05 D0 8D CC
C620:04 D0 60 EE A4 CE 20 FF 7F
C628:C6 A9 00 8D 29 D0 AD D2 17
C630:CF C9 00 F0 3C C9 09 D0 13
C638:0B A9 00 8D D2 CF EE D1 14
C640:CF 4C 22 C6 EE D2 CF 4C 28
C648:22 C6 EE A4 CE 20 14 C7 A7
C650:A9 01 8D 29 D0 AD D4 CF ED
C658:C9 00 F0 1F C9 09 D0 0B F9
C660:A9 00 8D D4 CF EE D3 CF 73
C668:4C 22 C6 EE D4 CF 4C 22 0D
C670:C6 AD D1 CF C9 02 F0 0D 49
C678:4C 44 C6 AD D3 CF C9 02 64
C680:F0 25 4C 6B C6 20 44 C6 16
C688:20 6A C5 A9 00 8D 15 D0 45
C690:A9 13 20 D2 FF A2 0A A0 28
C698:0A 18 20 F0 FF A9 E9 A0 5F
C6A0:C9 20 1E AB 4C C9 C6 20 D0
C6A8:6B C6 20 6A C5 A9 00 8D AA
C6B0:15 D0 A9 13 20 D2 FF A2 52
C6B8:0A A0 0A 18 20 F0 FF A9 A4
C6C0:F9 A0 C9 20 1E AB 4C C9 B0
C6C8:C6 20 0C C6 20 6A C5 A2 88
C6D0:11 A0 00 18 20 F0 FF A9 FE
C6D8:38 A0 CA 20 1E AB AD 00 01
C6E0:DC C9 6F D0 08 A9 01 8D C0
C6E8:8C CD 4C 05 C0 AD 01 DC A5
C6F0:C9 EF F0 03 4C DE C6 A9 C2
C6F8:00 8D 8C CD 4C 05 C0 A9 F9
C700:78 8D 05 D0 A9 E1 8D 04 D0
C708:D0 A9 FA 8D 35 CD 8D 34 D2
C710:CD 4C 22 C6 A9 78 8D 05 99
C718:D0 8D 04 D0 A9 FA 8D 35 8A
C720:CD 8D 34 CD 4C 22 C6 AD 83
C728:A4 CE C9 05 F0 29 C9 0A 11
C730:F0 6B C9 0F F0 64 C9 14 FD
C738:F0 1D C9 19 F0 5F C9 1E 09
C740:F0 58 A2 0A A0 0F 18 20 E4
C748:F0 FF A9 10 A0 CA 20 1E 15
C750:AB A9 06 8D A7 D9 60 A9 C8
C758:03 8D 82 CD A9 9B 8D 83 54
C760:CD EE 41 CE A9 93 20 D2 56
C768:FF A2 0A A0 0F 18 20 F0 F5
C770:FF A9 00 8D 15 D0 A9 09 8B
C778:A0 CA 20 1E AB AD 41 CE 56
C780:69 30 8D A7 05 A9 01 8D 5B
C788:A7 D9 A9 00 8D 42 CE CE 79
C790:42 CE D0 FB 20 23 C8 4C 3A
C798:42 C7 4C E0 C7 A9 03 8D 4B
C7A0:82 CD A9 64 8D 83 CD EE 65
C7A8:41 CE A9 93 20 D2 FF A2 E9
C7B0:0A A0 0F 18 20 F0 FF A9 3F
C7B8:00 8D 15 D0 A9 09 A0 CA D8
C7C0:20 1E AB AD 41 CE 69 30 80
C7C8:8D A7 05 A9 01 8D A7 D9 AB
C7D0:A9 00 8D 42 CE CE 42 CE 10
C7D8:D0 FB 20 23 C8 4C 42 C7 C9
C7E0:A9 02 8D 82 CD A9 96 8D 6F
C7E8:83 CD EE 41 CE A9 93 20 04
C7F0:D2 FF A2 0A A0 0F 18 20 70
C7F8:F0 FF A9 00 8D 15 D0 A9 42
C800:09 A0 CA 20 1E AB AD 41 D5
C808:CE 69 30 8D A7 05 A9 01 DF
C810:8D A7 D9 A9 00 8D 42 CE B1
C818:CE 42 CE D0 FB 20 23 C8 F7
C820:4C 42 C7 20 32 C8 A5 C5 29
C828:C9 04 D0 FA 20 44 C8 4C 59
C830:56 C7 A2 14 A0 08 18 20 E9
C838:F0 FF A9 1B A0 CA 20 1E B7
C840:AB 4C 56 C7 A2 14 A0 08 B0
C848:18 20 F0 FF A9 64 A0 CA F6
C850:20 1E AB 4C 56 C7 A9 41 1A
C858:8D 04 D4 A9 FF 8D DD CF A8
C860:8D DE CF 20 74 C8 A9 FF 86
C868:8D DD CF 8D DE CF A9 00 94
C870:8D 04 D4 60 A9 02 8D DC B7
C878:CF CE DC CF D0 01 60 CE 58
C880:DD CF D0 FB A9 9B 8D DD 83
C888:CF 4C 79 C8 A9 00 8D 87 C0
C890:CD A2 00 AC 87 CD 18 20 40
C898:F0 FF A9 18 A0 CA 20 1E E7
C8A0:AB EE 87 CD AD 87 CD C9 82
C8A8:28 D0 E6 A9 01 8D 87 CD 15
C8B0:A9 00 8D 88 CD AE 87 CD 57
C8B8:AC 88 CD 18 20 F0 FF A9 6C
C8C0:18 A0 CA 20 1E AB AD 88 65
C8C8:CD 69 26 8D 88 CD AE 87 99
C8D0:CD AC 88 CD 18 20 F0 FF 85
C8D8:A9 18 A0 CA 20 1E AB EE C5
C8E0:87 CD AD 87 CD C9 18 D0 6E
C8E8:C7 60 00 00 00 01 00 00 7A
C8F0:05 40 00 05 40 00 01 00 69
C8F8:00 02 00 00 0A 80 0C 2A 9F
C900:A0 3F AA 65 FF A9 65 FF D0
C908:26 80 3F 0A A0 0C 03 C0 53
C910:00 3F FC 00 3F FC 00 FC FD
C918:0F 00 50 01 40 50 01 40 D2
C920:50 01 40 A0 02 80 A0 00 81
C928:A0 00 00 00 00 00 10 03 2F
C930:00 54 0F 00 54 0F 00 10 A9
C938:0F 00 20 0C 00 A8 10 02 DC
C940:AA 50 02 AA 40 04 A8 00 8B
C948:14 A8 00 10 A8 00 50 FF F6
C950:00 03 FF D0 03 FF D4 0F 82
C958:C0 14 05 00 2A 04 00 20 73
C960:14 00 00 A0 00 00 80 00 09
C968:00 00 00 00 00 00 00 00 FB
C970:00 00 00 00 00 00 00 00 04
C978:00 00 7C 00 00 FE 00 00 97
C980:FE 00 00 FE 00 00 FE 00 81
C988:00 7C 00 00 00 00 00 00 3B
C990:00 00 00 00 00 00 00 00 24
C998:00 00 00 00 00 00 00 00 2C
C9A0:00 00 00 00 00 00 00 00 34
C9A8:00 58 90 50 4C 41 59 45 C8
C9B0:52 00 12 90 53 43 4F 52 51
C9B8:45 3A 92 90 00 12 90 20 62
C9C0:20 20 20 20 20 20 20 20 54
C9C8:20 20 20 20 20 20 20 20 5C
C9D0:20 20 20 20 20 20 20 20 64
C9D8:20 20 20 20 20 20 20 20 6C
C9E0:20 20 20 20 20 20 90 92 C7
C9E8:00 90 20 20 20 42 4C 41 8A
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C9F0:43 4B 20 57 49 4E 53 21 BD
C9F8:00 90 20 20 20 57 48 49 EE
CA00:54 45 20 57 49 4E 53 21 D5
CA08:00 90 4C 45 56 45 4C 00 FF
CA10:20 20 20 20 20 20 20 00 85
CA18:90 A6 00 90 20 20 12 50 9E
CA20:52 45 53 53 20 92 20 20 7B
CA28:46 31 20 20 12 20 54 4F 3C
CA30:20 42 45 47 49 4E 92 00 2C
CA38:90 12 46 49 52 45 20 31 11
CA40:20 46 4F 52 20 4E 45 57 A2
CA48:20 2D 20 46 49 52 45 20 DF
CA50:32 20 46 4F 52 20 53 41 BF
CA58:4D 45 20 50 4C 41 59 45 4E
CA60:52 53 92 00 20 20 20 20 28
CA68:20 20 20 20 20 20 20 20 FD
CA70:20 20 20 20 20 20 20 20 06
CA78:20 20 20 20 20 20 20 00 ED
CA80:05 53 20 43 20 48 20 4E 56
CA88:20 49 20 50 00 99 43 4F C5
CA90:50 59 52 49 47 48 54 20 A7
CA98:31 39 38 37 20 43 4F 4D 89
CAA0:50 55 54 45 21 20 50 55 12
CAA8:42 2E 2C 20 49 4E 43 2E AA
CAB0:00 9B 41 4C 4C 20 52 49 EA
CAB8:47 48 54 53 20 52 45 53 EB
CAC0:45 52 56 45 44 00 00 00 CE
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BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," elsewhere in this issue.

The *GEOS* Column

See instructions in article on page 75 before typing in.

Program 1: GeoPuzzle

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0304:BF 00 00 00 FF FF FE 80 68
030C:00 02 9F 7D F2 9F 45 F2 F1
0314:9F 45 F2 9F 7D F2 80 00 4C
031C:02 9F 7D F2 91 55 12 91 81
0324:55 12 9F 7D F2 80 00 02 C0
032C:9F 7D F2 9F 45 F2 9F 45 34
0334:F2 9F 7D F2 80 00 02 FF 82
033C:FF FE 00 00 00 00 00 00 02
0344:83 06 00 00 04 F3 07 00 8B
034C:04 47 45 4F 50 55 5A 5A AA
0354:4C 45 20 20 20 56 31 2E C2
035C:30 00 00 00 00 41 4E 44 60
0364:45 52 53 4F 4E 20 26 20 60
036C:48 45 4E 53 4C 45 59 00 11
0374:00 00 00 00 00 00 00 00 7A
037C:00 00 00 00 00 00 00 00 82
0384:00 00 00 00 00 00 00 00 8A
038C:00 00 00 00 00 00 00 00 92
0394:00 00 00 00 00 00 00 00 9A
039C:00 00 00 00 00 00 00 00 A2
03A4:00 00 00 00 00 00 00 00 AA
03AC:00 00 00 00 00 00 00 00 B2
03B4:00 00 00 00 00 00 00 00 BA
03BC:00 00 00 00 00 00 00 00 C2
03C4:00 00 00 00 00 00 00 00 CA
03CC:00 00 00 00 00 00 00 00 D2
03D4:00 00 00 00 00 00 00 00 DA
03DC:00 00 00 00 00 00 00 00 E2
03E4:00 00 00 00 00 00 00 00 EA
03EC:00 00 00 00 00 00 00 00 F2
03F4:00 00 00 00 00 00 00 00 FA
03FC:00 00 00 00 20 E1 C1 20 2F
0404:8A C1 A9 14 20 39 C1 20 C1
040C:9F C1 00 C7 00 00 3F 01 50
0414:A9 01 20 39 C1 20 9F C1 58
041C:20 A7 20 00 E7 00 20 6B 0D
0424:07 20 29 05 20 AE C1 68 D4
042C:00 12 47 45 4F 50 55 5A B6
0434:5A 4C 45 00 20 AE C1 0A 6E
043C:00 BC 43 4F 50 59 52 49 A6
0444:47 48 54 20 31 39 38 37 A4
044C:20 43 4F 4D 50 55 54 45 B9
0454:21 20 50 55 42 4C 49 43 6D
045C:41 54 49 4F 4E 53 2C 20 70
0464:49 4E 43 2E 20 2D 20 41 27
046C:4C 4C 20 52 49 47 48 54 23
0474:53 20 52 45 53 45 52 56 77
047C:45 44 00 A9 91 85 02 A9 23
0484:04 85 03 20 5A C1 60 20 0D
048C:6B 07 4C 2C C2 0E A0 00 E7
0494:64 05 05 0A 2A 01 08 63 1A
049C:06 05 05 0F 2A 01 08 78 58
04A4:06 05 05 14 2A 01 08 8D C5
04AC:06 0E 05 0A 97 01 08 A2 EF
04B4:06 0E 05 0F 97 01 08 B7 5D
04BC:06 0E 05 14 97 01 08 CC CA
04C4:06 20 05 06 41 01 08 E1 D8
04CC:06 20 05 06 61 01 08 F6 F6
04D4:06 20 05 06 81 01 08 0B 14
04DC:07 17 05 19 41 01 08 20 9E
04E4:07 17 05 19 61 01 08 35 BC
04EC:07 17 05 19 81 01 08 4A DA
04F4:07 E1 05 21 46 03 15 5F 73
04FC:07 22 06 21 6E 03 15 8B 19
0504:04 88 18 18 18 18 FF 7E 56
050C:3C 18 88 18 3C 7E FF 18 C0
0514:18 18 18 88 10 30 70 FF DD
051C:FF 70 30 10 88 08 0C 0E D3
0524:FF FF 0E 0C 08 AE CF 05 50
052C:BD D8 05 20 39 C1 20 9F 9E
0534:C1 38 4F 48 00 67 00 AE E7
053C:D0 05 BD D8 05 20 39 C1 12
0544:20 9F C1 38 4F 70 00 8F CD
054C:00 AE D1 05 BD D8 05 20 08
0554:39 C1 20 9F C1 38 4F 98 8F
055C:00 B7 00 AE D2 05 BD D8 3E
0564:05 20 39 C1 20 9F C1 58 97
056C:6F 48 00 67 00 AE D3 05 1E
0574:BD D8 05 20 39 C1 20 9F E6
057C:C1 58 6F 70 00 8F 00 AE 5F
0584:D4 05 BD D8 05 20 39 C1 5C
058C:20 9F C1 58 6F 98 00 B7 E1
0594:00 AE D5 05 BD D8 05 20 D0
059C:39 C1 20 9F C1 78 8F 48 09
05A4:00 67 00 AE D6 05 BD D8 92
05AC:05 20 39 C1 20 9F C1 78 FF
05B4:8F 70 00 8F 00 AE D7 05 0B
05BC:BD D8 05 20 39 C1 20 9F 2F
05C4:C1 78 8F 98 00 B7 00 20 48
05CC:7F 07 60 00 01 02 03 04 7E
05D4:05 06 07 08 1D 1E 1D 1E FD
05DC:18 1E 1D 1E 1D BF 00 00 E7
05E4:00 FF FF FE 80 00 02 9F 86
05EC:7D F2 9F 45 F2 9F 45 F2 4E
05F4:9F 7D F2 80 00 02 9F 7D 59
05FC:F2 91 55 12 91 55 12 9F 56
0604:7D F2 80 00 02 9F 7D F2 18
060C:9F 45 F2 9F 45 F2 9F 7D 44
0614:F2 80 00 02 FF FF FE 00 D7
061C:00 00 00 00 00 00 BF 00 A7
0624:00 00 FF FF FE 83 C7 82 48
062C:87 4F C2 8E 7D E2 9C 03 C4
0634:F2 9C 03 F2 BC 07 FA BE 27
063C:07 FA BE 73 FA BF 7B FA 62
0644:BE 3F FA BC 0F FA 9C 07 4F
064C:F2 9E 07 F2 8F 0F E2 87 8F
0654:9F C2 83 DF 82 FF FF FE 62
065C:00 00 00 00 00 00 04 AD 1E
0664:CF 05 AE D2 05 AC D5 05 28
066C:8D D2 05 8E D5 05 8C CF 29
0674:05 4C 29 05 AD D0 05 AE F4
067C:D3 05 AC D6 05 8D D3 05 C1
0684:8E D6 05 8C D0 05 4C 29 53
068C:05 AD D1 05 AE D4 05 AC 90
0694:D7 05 8D D4 05 8E D7 05 E3
069C:8C D1 05 4C 29 05 AD CF 51
06A4:05 AE D2 05 AC D5 05 8D DD
06AC:D5 05 8E CF 05 8C D2 05 B8
06B4:4C 29 05 AD D0 05 AE D3 78
06BC:05 AC D6 05 8D D6 05 8E 02
06C4:D0 05 8C D3 05 4C 29 05 F9
06CC:AD D1 05 AE D4 05 AC D7 9B
06D4:05 8D D7 05 8E D1 05 8C 64
06DC:D4 05 4C 29 05 AD CF 05 34
06E4:AE D0 05 AC D1 05 8D D0 76
06EC:05 8E D1 05 8C CF 05 4C A3
06F4:29 05 AD D2 05 AE D3 05 49
06FC:AC D4 05 8D D3 05 8E D4 B2
0704:05 8C D2 05 4C 29 05 AD 21
070C:D5 05 AE D6 05 AC D7 05 19
0714:8D D6 05 8E D7 05 8C D5 E9
071C:05 4C 29 05 AD CF 05 AE 9A
0724:D0 05 AC D1 05 8D D1 05 95
072C:8E CF 05 8C D0 05 4C 29 3B
0734:05 AD D2 05 AE D3 05 AC 56
073C:D4 05 8D D4 05 8E D2 05 02
0744:8C D3 05 4C 29 05 AD D5 81
074C:05 AE D6 05 AC D7 05 8D 10
0754:D7 05 8E D5 05 8C D6 05 CB
075C:4C 29 05 A2 08 8A 9D CF 1B
0764:05 CA 10 F9 4C 29 05 A2 FC
076C:FA A9 0E 9D FF 8B 9D F9 61
0774:8C 9D F3 8D 9D ED 8E CA 14
077C:D0 F1 60 A0 08 B9 CF 05 51
0784:AA B9 BD 07 85 70 B9 C6 A6
078C:07 85 71 98 48 A0 00 BD B9
0794:CF 07 91 70 C8 91 70 C8 BB
079C:BD D8 07 91 70 C8 91 70 F3
07A4:A0 50 BD E1 07 91 70 C8 15
07AC:91 70 C8 BD EA 07 91 70 9B
07B4:C8 91 70 68 A8 88 10 C5 6D
07BC:60 21 26 2B C1 C6 CB 61 DC
07C4:66 6B 8D 8D 8D 8D 8D 8D B6
07CC:8E 8E 8E 0E 0E 0E 0E 07 44
07D4:05 0E 02 04 0E 0E 0E 07 35
07DC:05 0E 02 04 0E 0E 0E 07 05 2D
07E4:0E 02 04 0E 0E 0E 07 05 97
07EC:0E 02 04 0E 0E 0E 0E 00 A8
```

Program 2: GeoConverter

```
10 REM COPYRIGHT 1987 COMPUTE!
   PUBLICATIONS, INC. - ALL R
   IGHTS RESERVED
20 POKE 53280,0:POKE 53281,0:P
   OKE 646,5:PRINT"{CLR}"
30 FORI=1TO10:PRINT"{DOWN}":NE
   XT
40 PRINTTAB(5)"{43}UDI COPYRIGH
   T 1987"
50 PRINTTAB(5)"GCH COMPUTE! PU
   BLICATIONS INC."
60 PRINTTAB(5)"JFK ALL RIGHTS
   {SPACE}RESERVED{HOME}"
70 PRINT"{DOWN}{RVS}{8}GEOCONV
   ERTER{OFF}{DOWN}{GRN}"
80 INPUT"FILE TO CONVERT";GF$
90 PRINT"{DOWN}SEARCHING FOR "
   GF$
100 HD$="":FOR I=1 TO 4:READ H
   E:HD$=HD$+CHR$(HE):NEXT
110 FOR I=1TO5:READIE:ID$=ID$+
   CHR$(IE):NEXT
120 NL$="":T$=CHR$(18):S$=CHR$
   (1):OPEN 15,8,15,"I0:":OPEN
   2,8,2,"#"
130 GOSUB360:GET #2,NT$,NS$
140 FOR E=0 TO 7
150 D$=NL$:GET#2,B$:I=1:IFB$=N
   L$ THEN210
160 IF ASC(B$)<>130 THEN210
170 GET#2,HT$,HS$:I=3
180 GET#2,B$:I=I+1
190 IF ASC(B$)=160 THEN210
200 D$=D$+B$:GOTO180
210 FOR I=I TO 31:GET#2,B$:NEX
   T
220 IF D$=GF$ THEN250
230 NEXT E:IF NT$=NL$ THEN250
240 T$=NT$:S$=NS$:GOTO130
250 IF D$=NL$ THENPRINT"{DOWN}
   {RVS}FILE NOT FOUND{OFF}":G
   OTO350
260 PRINT"{DOWN}CONVERTING "GF
   $
270 DT$=T$:DS$=S$:T$=HT$:S$=HS
   $:GOSUB360
```

```
280 GET#2,MT$,MS$
290 FOR I=0 TO 65:GET #2,B$:NE
    XT
300 GET#2,CT$,GT$:GOSUB360:PRI
    NT#2,HD$;:GOSUB370:T$=DT$:S
    $=DS$:GOSUB360
310 FOR I=0 TO 32*E+2:GET#2,B$
    :NEXT
320 PRINT#2,MT$;MS$;:FORI=0 TO
    15:GET#2,B$:NEXT
330 PRINT#2,HT$;HS$;CHR$(0);GT
    $;
340 PRINT#2,ID$;:GOSUB370:PRIN
    T:PRINTGF$" CONVERTED"
350 CLOSE2:CLOSE15:END
360 U$="U1":GOTO380
370 U$="U2"
380 PRINT#15,U$;2;0;ASC(T$+"0"
    );ASC(S$+"0")
390 RETURN
400 DATA 0,255,3,21,87,10,1,0,
    0
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," elsewhere in this issue.

Chopper Pilot

See instructions in article on page 54 before typing in.

```
0801:0B 08 0A 00 9E 32 34 32 32
0809:30 00 00 00 20 AC AC AC EA
0811:20 42 59 20 43 48 52 49 18
0819:53 20 42 4F 53 53 20 AC EC
0821:AC AC 00 00 00 FF FF FF B2
0829:FF FF FF FF FF FF FF FF 39
0831:FF FF FF FF FF FF FF FF 41
0839:FF FF FF FF FF FF FF 00 49
0841:00 00 F0 00 00 FF FF FF 6F
0849:00 03 00 00 2A 80 00 96 04
0851:A0 02 56 A0 09 76 A8 25 9F
0859:76 AA 95 F6 A2 95 76 A2 6C
0861:95 F6 AA 95 EA A2 A5 EA C0
0869:A2 AA AA AA 2A AA AA 02 C8
0871:AA A8 00 80 80 00 80 80 8E
0879:08 80 80 0A AA A8 00 00 56
0881:00 00 00 00 00 FC 00 00 85
0889:3C 00 00 00 00 00 00 00 B7
0891:30 00 00 30 00 00 30 AA C7
0899:AA FC 08 82 FC 08 8A B0 35
08A1:A8 A8 30 0A 80 30 2A 00 EF
08A9:00 A8 00 00 80 00 00 00 E7
08B1:00 00 00 00 00 00 00 00 C1
08B9:00 00 00 00 00 00 00 00 C9
08C1:00 00 00 F0 00 00 FF FC DD
08C9:00 03 3C 00 2A 80 00 96 0C
08D1:A0 02 56 A0 09 76 A8 25 20
08D9:76 AA 95 F6 A2 95 76 A2 EC
08E1:95 F6 AA 95 EA A2 A5 EA 41
08E9:A2 AA AA AA 2A AA AA 02 49
08F1:AA A8 00 80 80 00 80 80 0F
08F9:08 80 80 0A AA A8 00 00 D6
0901:00 00 00 00 00 00 00 00 13
0909:00 00 00 00 00 00 00 00 1B
0911:00 00 00 CC 00 00 CC AA 34
0919:AA F0 08 82 BC 08 8A EC ED
0921:A8 A8 CC 0A 80 00 2A 00 44
0929:00 A8 00 00 80 00 00 00 69
0931:00 00 00 00 00 00 00 00 43
0939:00 00 00 00 00 00 00 00 4B
0941:00 0F 0F 0F 08 08 08 08 62
0949:08 F8 F8 F8 08 08 08 08 C4
0951:08 00 00 00 18 28 48 08 61
0959:08 08 3E 08 3E 08 08 08 E3
0961:08 1C 7A 5F 6F 3C 08 08 48
0969:08 00 90 00 49 00 91 00 FE
0971:48 00 00 4C D9 09 00 00 5F
0979:00 00 00 00 00 00 00 00 8B
0981:00 00 00 00 00 00 00 00 93
0989:00 00 00 00 00 00 00 00 9B
0991:00 00 00 00 00 00 00 00 A3
0999:00 00 C5 09 00 00 00 00 F4
09A1:00 00 00 00 00 00 00 00 B3
09A9:00 00 00 00 00 00 00 00 BB
09B1:00 00 00 00 00 00 D9 09 80
09B9:00 00 00 00 00 00 00 00 CB
09C1:00 00 00 00 00 00 00 00 D3
09C9:00 00 00 00 00 00 00 00 DB
09D1:00 00 00 00 00 00 00 00 E3
09D9:20 E3 1D 4C 9E 0E AD 77 5D
09E1:09 48 AD 78 09 48 AD 79 06
09E9:09 48 AD 7A 09 48 AD 7B 30
09F1:09 48 AD 91 09 8D 77 09 DF
09F9:AD 77 09 48 AD 92 09 8D BD
0A01:77 09 AD 77 09 48 EE 7D 05
0A09:09 AD 7D 09 38 E9 14 F0 CF
0A11:02 B0 03 4C 3F 0A AD F8 ED
0A19:07 8D 77 09 AD 77 09 38 29
0A21:E9 21 D0 03 4C 35 0A A9 B1
0A29:21 8D F8 07 A9 22 8D F9 AB
0A31:07 4C 3F 0A A9 23 8D F8 52
0A39:07 A9 24 8D F9 07 AD B2 92
0A41:02 8D 79 09 AD B3 02 8D 47
0A49:7A 09 AD 7A 09 38 E9 1A 51
0A51:D0 03 4C B2 0D EE 79 09 63
0A59:AD 79 09 8D B2 02 AD 79 0F
0A61:09 38 ED 7A 09 F0 02 B0 2E
0A69:03 4C B2 0D A9 00 8D B2 54
0A71:02 AD 7D 09 18 69 0F 8D 44
0A79:7D 09 AD A9 09 18 69 01 5B
0A81:8D A9 09 AD AA 09 69 00 0F
0A89:8D AA 09 AD BC 02 8D 77 8B
0A91:09 AD 77 09 38 E9 00 F0 6F
0A99:03 4C C6 0A AD DF 02 8D 3A
0AA1:78 09 EE 78 09 AD 78 09 92
0AA9:8D DF 02 AD 78 09 38 E9 D9
0AB1:14 F0 02 B0 03 4C D9 0A 5E
0AB9:A9 00 8D DF 02 A9 01 8D 98
0AC1:77 09 4C D9 0A AD 1B D4 0D
0AC9:29 03 8D 77 09 AD 77 09 53
0AD1:38 E9 03 D0 03 4C 8C 0A 56
0AD9:AD 77 09 8D B5 02 AD BC 6A
0AE1:02 8D 7A 09 AD 77 09 38 CF
0AE9:E9 00 D0 03 4C 43 0B AD 70
0AF1:77 09 38 E9 02 D0 03 4C 4F
0AF9:1A 0B AD 7A 09 18 6D 82 41
0B01:09 8D 7A 09 AD 7A 09 38 80
0B09:E9 14 F0 02 B0 03 4C 43 C4
0B11:0B A9 14 8D 7A 09 4C 43 46
0B19:0B AD 7A 09 38 E9 00 D0 3A
0B21:03 4C 43 0B AD 7A 09 38 86
0B29:ED 82 09 F0 02 90 03 4C AB
0B31:39 0B CE 7A 09 4C 43 0B 33
0B39:AD 7A 09 38 ED 82 09 8D 82
0B41:7A 09 20 35 1D A9 D0 8D EC
0B49:91 09 A9 02 8D 92 09 A9 32
0B51:00 8D 77 09 AD 91 09 8D 9D
0B59:62 0B AD 92 09 8D 63 0B 92
0B61:AD 00 00 8D 78 09 AD 91 FB
0B69:09 18 69 01 8D 91 09 AD B9
0B71:92 09 69 00 8D 92 09 AD B6
0B79:91 09 85 FB AD 92 09 85 5A
0B81:FC AD 78 09 A0 00 91 FB 45
0B89:AD 91 09 38 E9 02 8D 91 83
0B91:09 AD 92 09 E9 00 8D 92 77
0B99:09 EE 77 09 AD 77 09 38 05
0BA1:E9 15 F0 03 4C 55 0B AD BB
0BA9:7A 09 8D BC 02 AD 7A 09 81
0BB1:38 E9 00 F0 03 4C E0 0B 83
0BB9:AD 95 09 8D 77 09 AD 96 D7
0BC1:09 8D 78 09 AD 87 09 38 35
0BC9:ED 77 09 D0 03 4C DA 0B EC
0BD1:AD 77 09 8D 87 09 4C E0 70
0BD9:0B AD 78 09 8D 87 09 A9 C6
0BE1:00 8D 91 09 A9 04 8D 92 29
0BE9:09 A9 00 8D C3 09 A9 D8 36
0BF1:8D C4 09 A9 00 8D 77 09 E9
0BF9:A9 20 8D 78 09 A9 1A 8D D6
0C01:79 09 AD 79 09 38 ED 7A E4
0C09:09 8D 79 09 A9 00 8D 7A AB
0C11:09 AD 7A 09 18 69 02 8D F0
0C19:7A 09 AD 7A 09 38 ED 79 8C
0C21:09 F0 02 B0 03 4C 4E 0C 37
0C29:A9 A0 8D 78 09 AD 7A 09 74
0C31:8D 7B 09 AD 7B 09 38 ED 49
0C39:79 09 8D 7B 09 AD 7B 09 B8
0C41:38 E9 01 F0 03 4C 4E 0C 11
0C49:A9 62 8D 78 09 AD 91 09 33
0C51:85 FB AD 92 09 85 FC AD 10
0C59:78 09 A0 00 91 FB AD 91 6D
0C61:09 18 69 28 8D 91 09 AD 26
0C69:92 09 69 00 8D 92 09 AD B0
0C71:C3 09 85 FB AD C4 09 85 36
0C79:FC AD 87 09 A0 00 91 FB 21
0C81:AD C3 09 18 69 28 8D C3 CE
0C89:09 AD C4 09 69 00 8D C4 E5
0C91:09 EE 77 09 AD 77 09 38 FE
0C99:E9 0D F0 03 4C 12 0C 20 1B
0CA1:F6 1E AD 1F D0 29 03 8D 23
0CA9:77 09 AD 77 09 8D DB 02 25
0CB1:AD 77 09 8D DD 02 20 64 14
0CB9:21 AD DB 02 8D 77 09 AD 73
0CC1:77 09 38 E9 00 D0 03 4C 13
0CC9:01 0D AD 99 09 18 69 01 71
0CD1:8D 99 09 AD 9A 09 69 00 DE
0CD9:8D 9A 09 AD B6 09 8D 77 C7
0CE1:09 AD 77 09 38 E9 00 D0 A3
0CE9:03 4C AF 0D AD B5 09 38 EB
0CF1:E9 19 8D B5 09 AD B6 09 C7
0CF9:E9 00 8D B6 09 4C AF 0D 0A
0D01:AD B3 02 8D 77 09 AD 77 AA
0D09:09 38 E9 1A D0 03 4C AF 6F
0D11:0D AD D1 02 8D 78 09 AD 85
0D19:86 09 8D 79 09 0E 78 09 7C
0D21:0E 78 09 AD 79 09 38 ED AA
0D29:78 09 8D 79 09 AD 79 09 06
0D31:38 E9 08 F0 02 90 03 4C 96
0D39:4F 0D AD B5 09 18 69 05 CF
0D41:8D B5 09 AD B6 09 69 00 38
0D49:8D B6 09 4C AF 0D AD 79 44
0D51:09 38 E9 10 F0 02 90 03 EF
0D59:4C 70 0D AD B5 09 18 69 9D
0D61:04 8D B5 09 AD B6 09 69 EB
0D69:00 8D B6 09 4C AF 0D AD 37
0D71:79 09 38 E9 18 F0 02 90 49
0D79:03 4C 91 0D AD B5 09 18 99
0D81:69 02 8D B5 09 AD B6 09 53
0D89:69 00 8D B6 09 4C AF 0D 5B
0D91:AD 79 09 38 E9 24 F0 02 49
0D99:90 03 4C AF 0D AD B5 09 D4
0DA1:18 69 01 8D B5 09 AD B6 FE
0DA9:09 69 00 8D B6 09 4C E7 D5
0DB1:0D AD 1F D0 29 03 8D DB FA
0DB9:02 8D DD 02 20 64 21 AD 96
0DC1:DC 02 8D 77 09 A9 19 8D A2
0DC9:78 09 CE 78 09 AD 78 09 BC
0DD1:38 E9 00 F0 03 4C CB 0D 7F
0DD9:CE 77 09 AD 77 09 38 E9 6F
0DE1:00 F0 03 4C C6 0D AD DB FE
0DE9:02 29 03 8D 77 09 A9 00 BB
0DF1:8D DB 02 A9 0E 8D 78 09 45
0DF9:AD 77 09 38 E9 00 D0 03 61
0E01:4C 09 0E A9 02 8D 78 09 22
0E09:AD 78 09 8D 20 D0 AD DD 91
0E11:02 8D 77 09 AD 77 09 38 A6
0E19:E9 00 D0 03 4C 23 0E 20 9F
0E21:16 20 A9 02 A8 A9 13 AA 62
0E29:18 20 F0 FF AD 99 09 8D EA
0E31:AB 09 AD 9A 09 8D AC 09 A5
0E39:20 1E 1A AD B3 02 8D 7B 47
0E41:09 0E 7B 09 0E 7B 09 A9 7F
0E49:68 8D 78 09 AD 78 09 38 36
0E51:ED 7B 09 8D 78 09 A9 00 78
0E59:8D 7B 09 AD 78 09 8D AB C5
0E61:09 AD 7B 09 8D AC 09 A9 48
0E69:10 A8 A9 13 AA 18 20 F0 05
0E71:FF 20 1E 1A 68 8D 78 09 6E
0E79:68 8D 77 09 AD 77 09 8D 97
0E81:91 09 AD 78 09 8D 92 09 92
0E89:68 8D 7B 09 68 8D 7A 09 B4
0E91:68 8D 79 09 68 8D 78 09 78
0E99:68 8D 77 09 60 A9 00 8D 04
0EA1:DB 02 A9 01 8D B6 02 A9 66
0EA9:01 8D 82 09 A9 B8 8D A7 7D
```

```
0EB1:09 A9 0B 8D A8 09 A9 05 B8
0EB9:8D 77 09 A9 05 8D 78 09 8E
0EC1:AD 77 09 8D 95 09 AD 78 31
0EC9:09 8D 96 09 A9 00 8D B5 4F
0ED1:09 A9 00 8D B6 09 A9 00 E2
0ED9:8D 99 09 A9 00 8D 9A 09 53
0EE1:A9 B4 8D 8C 09 A9 08 8D 07
0EE9:DA 02 A9 19 8D DC 02 A9 48
0EF1:50 8D 9D 09 A9 46 8D 9E FD
0EF9:09 20 CC 11 AD B5 09 8D 31
0F01:91 09 AD B6 09 8D 92 09 F7
0F09:A9 50 8D 93 09 A9 46 8D 04
0F11:94 09 20 A5 19 AD 79 09 95
0F19:38 E9 00 D0 03 4C B9 10 A7
0F21:A9 02 8D 82 09 A9 D0 8D 8C
0F29:A7 09 A9 07 8D A8 09 A9 CD
0F31:06 8D 77 09 A9 05 8D 78 2A
0F39:09 AD 77 09 8D 95 09 AD 49
0F41:78 09 8D 96 09 A9 8C 8D 8E
0F49:8C 09 A9 00 8D 99 09 A9 B3
0F51:00 8D 9A 09 A9 08 8D DA 1A
0F59:02 A9 14 8D DC 02 A9 A8 29
0F61:8D 9D 09 A9 61 8D 9E 09 F0
0F69:20 CC 11 AD B5 09 8D 91 46
0F71:09 AD B6 09 8D 92 09 A9 59
0F79:A8 8D 93 09 A9 61 8D 94 D4
0F81:09 20 A5 19 AD 79 09 38 10
0F89:E9 00 D0 03 4C B9 10 A9 F9
0F91:03 8D 82 09 A9 D0 8D A7 C8
0F99:09 A9 07 8D A8 09 A9 09 26
0FA1:8D 77 09 A9 02 8D 78 09 60
0FA9:AD 77 09 8D 95 09 AD 78 1B
0FB1:09 8D 96 09 A9 96 8D 8C 6A
0FB9:09 A9 00 8D 99 09 A9 00 E3
0FC1:8D 9A 09 A9 06 8D DA 02 27
0FC9:A9 0F 8D DC 02 A9 18 8D 74
0FD1:9D 09 A9 79 8D 9E 09 20 E6
0FD9:CC 11 AD B5 09 8D 91 09 5E
0FE1:AD B6 09 8D 92 09 A9 18 A2
0FE9:8D 93 09 A9 79 8D 94 09 A3
0FF1:20 A5 19 AD 79 09 38 E9 D1
0FF9:00 D0 03 4C B9 10 A9 05 D7
1001:8D 82 09 A9 D0 8D A7 09 59
1009:A9 07 8D A8 09 A9 02 8D 7C
1011:77 09 A9 08 8D 78 09 AD F2
1019:77 09 8D 95 09 AD 78 09 3B
1021:8D 96 09 A9 A0 8D 8C 09 C6
1029:A9 00 8D 99 09 A9 00 8D E5
1031:9A 09 A9 04 8D DA 02 A9 DB
1039:0A 8D DC 02 A9 A0 8D 9D 06
1041:09 A9 8C 8D 9E 09 20 CC E0
1049:11 AD B5 09 8D 91 09 AD 17
1051:B6 09 8D 92 09 A9 A0 8D A7
1059:93 09 A9 8C 8D 94 09 20 74
1061:A5 19 AD 79 09 38 E9 00 E4
1069:D0 03 4C B9 10 A9 07 8D 9A
1071:82 09 A9 D0 8D A7 09 A9 1E
1079:07 8D A8 09 A9 04 8D 77 16
1081:09 A9 0A 8D 78 09 AD 77 65
1089:09 8D 95 09 AD 78 09 8D C3
1091:96 09 A9 AA 8D 8C 09 A9 79
1099:00 8D 99 09 A9 00 8D 9A E3
10A1:09 A9 02 8D DA 02 A9 05 01
10A9:8D DC 02 A9 00 8D 9D 09 1D
10B1:A9 00 8D 9E 09 20 CC 11 B5
10B9:20 E4 FF 8D 77 09 AD 77 AE
10C1:09 38 E9 00 F0 03 4C B9 97
10C9:10 A9 0E A8 A9 01 AA 18 67
10D1:20 F0 FF A9 47 8D 78 09 43
10D9:20 2E 1D A9 41 8D 78 09 0E
10E1:20 2E 1D A9 4D 8D 78 09 76
10E9:20 2E 1D A9 45 8D 78 09 3E
10F1:20 2E 1D A9 20 8D 78 09 1D
10F9:20 2E 1D A9 4F 8D 78 09 9E
1101:20 2E 1D A9 56 8D 78 09 DF
1109:20 2E 1D A9 45 8D 78 09 5F
1111:20 2E 1D A9 52 8D 78 09 CF
1119:20 2E 1D A9 0E A8 A9 03 7E
1121:AA 18 20 F0 FF A9 41 8D 68
1129:78 09 20 2E 1D A9 47 8D 5C
1131:78 09 20 2E 1D A9 41 8D 58
1139:78 09 20 2E 1D A9 49 8D 70
1141:78 09 20 2E 1D A9 4E 8D 82
1149:78 09 20 2E 1D A9 20 8D 2E
1151:78 09 20 2E 1D A9 59 8D A8
1159:78 09 20 2E 1D A9 2F 8D 5C
1161:78 09 20 2E 1D A9 4E 8D A2
1169:78 09 20 2E 1D A9 3F 8D 8C
1171:78 09 20 2E 1D A9 1D 8D 50
1179:78 09 20 2E 1D A9 00 8D 1E
1181:CC 00 20 E4 FF 8D 78 09 8C
1189:AD 78 09 38 E9 00 D0 03 39
1191:4C 83 11 A9 FF 8D CC 00 47
1199:20 2E 1D AD 78 09 8D 77 50
11A1:09 A9 9D 8D 78 09 20 2E 95
11A9:1D AD 77 09 38 E9 59 D0 32
11B1:03 4C 9E 0E AD 77 09 38 B2
11B9:E9 4E F0 03 4C 83 11 A9 EE
11C1:93 8D 78 09 20 2E 1D 20 C4
11C9:EB 1E 60 A9 00 8D DF 02 08
11D1:A9 FF 8D 0F D4 A9 80 8D 47
11D9:12 D4 A9 80 8D 18 D4 AD 9B
11E1:95 09 8D 87 09 A9 93 8D DE
11E9:78 09 20 2E 1D A9 01 8D 90
11F1:21 D0 A9 0E 8D 20 D0 A9 27
11F9:00 8D 8E 09 A9 0D 8D 8F 0E
1201:09 A9 27 8D 80 09 A9 18 65
1209:8D 81 09 A9 A0 8D 86 09 61
1211:A9 0E 8D 79 09 20 CD 1C 57
1219:A9 01 8D 8E 09 A9 0F 8D 87
1221:8F 09 A9 26 8D 80 09 A9 11
1229:14 8D 81 09 A9 A0 8D 86 EC
1231:09 A9 00 8D 79 09 20 CD 1B
1239:1C A9 0F 8D 8E 09 A9 15 91
1241:8D 8F 09 A9 18 8D 80 09 CC
1249:A9 18 8D 81 09 A9 A0 8D CF
1251:86 09 A9 00 8D 79 09 20 B4
1259:CD 1C A9 12 8D 78 09 20 42
1261:2E 1D A9 81 8D 78 09 20 B1
1269:2E 1D A9 0F A8 A9 0E AA C4
1271:18 20 F0 FF A9 48 8D 78 C9
1279:09 20 2E 1D A9 45 8D 78 B7
1281:09 20 2E 1D A9 4C 8D 78 DB
1289:09 20 2E 1D A9 49 8D 78 D7
1291:09 20 2E 1D A9 43 8D 78 C7
1299:09 20 2E 1D A9 4F 8D 78 FF
12A1:09 20 2E 1D A9 50 8D 78 0C
12A9:09 20 2E 1D A9 54 8D 78 24
12B1:09 20 2E 1D A9 45 8D 78 EF
12B9:09 20 2E 1D A9 52 8D 78 2C
12C1:09 20 2E 1D A9 1E 8D 78 63
12C9:09 20 2E 1D A9 02 A8 A9 62
12D1:0F AA 18 20 F0 FF A9 1C 24
12D9:8D 78 09 20 2E 1D A9 53 92
12E1:8D 78 09 20 2E 1D A9 43 8A
12E9:8D 78 09 20 2E 1D A9 4F 9E
12F1:8D 78 09 20 2E 1D A9 52 A9
12F9:8D 78 09 20 2E 1D A9 45 A4
1301:8D 78 09 20 2E 1D A9 1E 86
1309:A8 A9 0F AA 18 20 F0 FF 9D
1311:A9 4D 8D 78 09 20 2E 1D DA
1319:A9 49 8D 78 09 20 2E 1D E1
1321:A9 4C 8D 78 09 20 2E 1D AA
1329:A9 45 8D 78 09 20 2E 1D F0
1331:A9 53 8D 78 09 20 2E 1D 7C
1339:A9 20 8D 78 09 20 2E 1D B7
1341:A9 02 A8 A9 12 AA 18 20 F7
1349:F0 FF A9 45 8D 78 09 20 F1
1351:2E 1D A9 52 8D 78 09 20 B0
1359:2E 1D 20 2E 1D A9 4F 8D 80
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2181:09 48 AD 78 09 48 AD D0 2D
2189:02 8D 77 09 AD 77 09 38 45
2191:E9 03 F0 02 90 03 4C 82 73
2199:22 AD DB 02 29 02 8D 77 D7
21A1:09 AD 77 09 38 E9 02 D0 91
21A9:03 4C 82 22 A9 00 8D 78 D3
21B1:09 AD F4 05 8D 77 09 AD DC
21B9:77 09 38 E9 20 D0 03 4C 36
21C1:F2 21 AD 77 09 38 E9 64 54
21C9:D0 03 4C F2 21 AD 77 09 A5
21D1:38 E9 65 D0 03 4C F2 21 B4
21D9:AD 77 09 38 E9 66 D0 03 03
21E1:4C F2 21 AD 77 09 38 E9 40
21E9:62 D0 03 4C F2 21 EE 78 29
21F1:09 AD F5 05 8D 77 09 AD 3D
21F9:77 09 38 E9 20 D0 03 4C 76
2201:32 22 AD 77 09 38 E9 64 75
2209:D0 03 4C 32 22 AD 77 09 E2
2211:38 E9 65 D0 03 4C 32 22 75
2219:AD 77 09 38 E9 66 D0 03 44
2221:4C 32 22 AD 77 09 38 E9 71
2229:62 D0 03 4C 32 22 EE 78 68
2231:09 AD F6 05 8D 77 09 AD 9E
2239:77 09 38 E9 20 D0 03 4C B7
2241:72 22 AD 77 09 38 E9 64 D5
2249:D0 03 4C 72 22 AD 77 09 27
2251:38 E9 65 D0 03 4C 72 22 36
2259:AD 77 09 38 E9 66 D0 03 84
2261:4C 72 22 AD 77 09 38 E9 C1
2269:62 D0 03 4C 72 22 EE 78 AA
2271:09 AD 78 09 38 E9 00 F0 9F
2279:03 4C 82 22 A9 00 8D DB 09
2281:02 68 8D 78 09 68 8D 77 96
2289:09 60 00 00 00 00 00 00 6A
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," elsewhere in this issue.

Directory Magic

See instructions in article on page 82 before typing in.

```
0801:0B 08 0A 00 9E 32 30 37 2F
0809:35 00 00 00 00 00 07 0B CC
0811:05 0E 06 04 01 0E 0F 06 8C
0819:00 1E AD 14 08 8D 86 02 2D
0821:AD 0E 08 8D 21 D0 AD 0D 1A
0829:08 8D 20 D0 A9 93 20 D2 60
0831:FF A2 02 A0 0A A9 00 20 4B
0839:2E 12 A2 06 A0 1D A9 A6 0D
0841:20 2E 12 AD 0F 08 8D 86 44
0849:02 18 A2 04 A0 0C 20 F0 5B
0851:FF A9 CE A2 18 20 15 12 4D
0859:18 A2 0A A0 01 20 F0 FF D3
0861:A9 B0 A2 1A 20 15 12 20 02
0869:C3 11 A9 93 20 D2 FF AD 08
0871:14 08 8D 86 02 A2 08 A0 F2
0879:0A A9 00 20 2E 12 A2 0C 06
0881:A0 1D A9 A6 20 2E 12 A2 49
0889:0E A0 08 A9 00 20 2E 12 53
0891:A2 13 A0 1F A9 A6 20 2E 14
0899:12 AD 12 08 8D 86 02 18 83
08A1:A2 0A A0 0C 20 F0 FF A9 C8
08A9:CE A2 18 20 15 12 18 A2 92
08B1:10 A0 0E 20 F0 FF A9 DF 70
08B9:A2 18 20 15 12 A2 11 A0 54
08C1:0A 20 F0 FF A9 00 8D 7A DF
08C9:1B 8D 7D 1B 8D 7C 1B 20 E0
08D1:46 0F 20 D6 0F 20 5F 10 02
08D9:20 EC 0F 20 0C 11 20 E1 DF
08E1:0E 20 29 0F 20 46 0F A9 F8
08E9:12 8D 0A 11 A9 01 8D 0B 30
08F1:11 20 CB 10 20 84 0F 20 5E
08F9:6B 11 20 EC 0F EE 7A 1B 1B
0901:AC 0B 11 C0 FF D0 EA 20 93
0909:AE 0F 20 60 11 AD 7A 1B 8F
0911:0A 0A 0A 8D 7A 1B 20 46 8B
0919:0F A9 03 8D 79 1B CE 81 AD
0921:1B A9 93 20 D2 FF 20 C1 38
0929:0E 20 53 0F 20 7E 12 AD 72
0931:81 1B 85 06 E6 06 AD 80 07
0939:1B 18 69 40 90 02 E6 06 70
0941:85 05 18 A0 02 A5 CB 20 C2
0949:6B 11 C9 15 D0 0A AD 8D 77
0951:02 C9 04 D0 EE 4C 0C 16 3B
0959:C9 0A D0 06 20 7A 15 20 82
0961:1C 0A C9 24 D0 1C AD 8D 5F
0969:02 C9 01 D0 0F 20 24 0A 67
0971:20 C4 13 20 24 0A 20 1C CE
0979:0A 4C 83 09 20 C4 13 20 FE
0981:1C 0A C9 03 D0 11 AE 7A 30
0989:1B EC 79 1B F0 32 EE 79 EC
0991:1B 20 40 14 20 1C 0A C9 D1
0999:06 D0 10 AE 79 1B E0 01 CA
09A1:F0 25 CE 79 1B 20 24 14 9C
09A9:20 1C 0A C9 04 D0 11 A2 D8
09B1:01 8E 7C 1B CA AD 13 08 64
09B9:9D F6 D9 E8 E0 12 D0 F8 0C
09C1:C9 05 D0 03 20 33 0A A0 C6
09C9:03 B1 05 C9 00 D0 03 4C 9C
09D1:30 09 A0 02 A5 CB C9 12 74
09D9:D0 03 20 44 0A C9 1E D0 E1
09E1:03 20 FB 0A C9 2A D0 03 39
09E9:20 E1 0A C9 26 D0 03 20 FC
09F1:EF 0A C9 11 D0 03 20 11 AC
09F9:0D C9 21 D0 03 20 03 0E E2
0A01:C9 14 D0 03 20 85 0B C9 40
0A09:0D D0 0A AD 8D 02 C9 04 FF
0A11:D0 03 20 7F 0A 4C 30 09 35
0A19:EA EA EA 20 7E 12 A0 02 3C
0A21:A5 CB 60 AD D8 13 48 AD 33
0A29:FC 13 8D D8 13 68 8D FC 12
0A31:13 60 AD 12 08 A2 00 8E 17
0A39:7C 1B 9D F6 D9 E8 E0 12 BB
0A41:D0 F8 60 B1 05 C9 BF B0 A2
0A49:14 C9 00 F0 0F A9 00 91 99
0A51:05 20 33 0A 20 1C 0A A9 26
0A59:01 8D 7D 1B 60 AD 15 08 9E
0A61:8D 86 02 A9 45 A2 18 20 BD
0A69:15 12 20 C3 11 20 1C 0A 18
0A71:60 AD 15 08 8D 86 02 A9 78
0A79:72 A2 18 4C 68 0A B1 05 0B
0A81:C9 BF B0 D9 C9 00 F0 57 A5
0A89:C9 05 90 E5 A0 05 B1 05 B5
0A91:C9 2C F0 DD A0 02 20 D6 B5
0A99:0F 18 A2 0F 20 C9 FF 90 39
0AA1:03 4C 2D 11 EE 20 D0 A9 44
0AA9:53 20 D2 FF A9 30 20 D2 EA
0AB1:FF A9 3A 20 D2 FF A0 05 56
0AB9:B1 05 20 D2 FF C8 C0 16 D3
0AC1:D0 F6 A9 0D 20 D2 FF 20 6E
0AC9:CC FF 20 EC 0F 20 60 11 E1
0AD1:CE 20 D0 A9 00 A0 02 91 22
0AD9:05 20 33 0A 20 1C 0A 60 65
0AE1:B1 05 C9 05 90 07 09 40 8C
0AE9:91 05 20 1C 0A 60 B1 05 08
0AF1:F0 07 29 BF 91 05 20 1C 5E
0AF9:0A 60 B1 05 D0 FB A0 05 6E
0B01:A2 00 B1 05 9D 82 1B C8 E4
0B09:E8 E0 10 D0 F5 20 8C 0C 30
0B11:AD 7E 1B F0 10 20 99 11 55
0B19:AD 14 08 8D 86 02 A9 B9 2E
0B21:A2 18 4C 68 0A 18 A2 00 94
0B29:A0 09 20 F0 FF AD 15 08 CD
0B31:8D 86 02 BD DB 17 20 D2 1A
0B39:FF E8 E0 1A D0 F5 18 A2 78
0B41:01 A0 08 20 F0 FF CA BD DD
0B49:F5 17 C9 00 F0 07 20 D2 10
0B51:FF E8 4C 48 0B 20 6B 11 70
0B59:A5 CB C9 01 D0 07 20 99 FA
0B61:11 20 1C 0A 60 C9 38 D0 97
0B69:05 A9 82 4C 75 0B C9 3B 28
0B71:D0 E3 A9 81 A0 02 91 05 6B
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0B79:20 7E 12 A2 01 8E 7D 1B 04
0B81:20 99 11 60 20 56 0C A2 4B
0B89:10 A9 A0 CA 9D 82 1B D0 D0
0B91:FA A0 00 84 C6 88 18 20 3E
0B99:4B 0C A9 00 8D 8B 0C 20 60
0BA1:E4 FF C9 00 F0 F9 C9 13 79
0BA9:F0 F5 C9 1D F0 F1 C9 11 B4
0BB1:F0 ED C9 91 F0 E9 C9 93 64
0BB9:F0 E5 C9 94 F0 E1 C9 9D 84
0BC1:F0 DD C9 22 F0 D9 C9 24 C9
0BC9:F0 D5 C9 2A F0 D1 C9 2C 38
0BD1:F0 CD C9 3F F0 C9 C9 14 57
0BD9:F0 21 C9 0D F0 38 C9 8D 44
0BE1:D0 03 4C 22 09 AE 8B 0C F2
0BE9:E0 10 F0 B3 9D 82 1B EE E9
0BF1:8B 0C 20 D2 FF 20 4B 0C 25
0BF9:4C A0 0B AE 8B 0C E0 00 F8
0C01:F0 9D A9 14 20 D2 FF CE 8A
0C09:8B 0C CA A9 A0 9D 82 1B 79
0C11:20 4B 0C 4C A0 0B A2 0F D7
0C19:BC 82 1B C0 A0 D0 0B E0 DE
0C21:00 D0 03 4C 22 09 CA 4C A9
0C29:19 0C 20 8C 0C AD 7E 1B CC
0C31:D0 3F A0 05 A2 00 86 D4 DC
0C39:BD 82 1B 91 05 C8 E8 E0 4B
0C41:10 D0 F5 20 99 11 20 7E 26
0C49:12 60 A9 E4 20 D2 FF A9 FB
0C51:9D 20 D2 FF 60 AD 12 08 80
0C59:8D 86 02 A9 0E A2 18 20 FF
0C61:15 12 AD 0F 08 8D 86 02 B4
0C69:18 A2 00 A0 14 20 F0 FF 43
0C71:60 20 99 11 AD 14 08 8D 61
0C79:86 02 A9 B9 A2 18 20 15 F0
0C81:12 20 C3 11 20 99 11 4C 0A
0C89:85 0B 00 A9 00 8D 7E 1B 10
0C91:AD 19 08 85 FB AD 1A 08 F2
0C99:85 FC 4C A9 0C A5 FB 18 DE
0CA1:69 20 90 02 E6 FC 85 FB DA
0CA9:A0 02 B1 FB C9 20 F0 1A 53
0CB1:C9 00 F0 E9 A0 05 A2 00 C9
0CB9:B1 FB DD 82 1B D0 DE E8 50
0CC1:C8 C0 15 D0 F3 A9 01 8D F3
0CC9:7E 1B 60 AD 18 08 8D 86 51
0CD1:02 AD 16 08 8D 20 D0 AD D5
0CD9:17 08 8D 21 D0 A9 93 20 B7
0CE1:D2 FF 18 A2 17 A0 00 20 EB
0CE9:F0 FF A9 6C A2 1A 20 15 49
0CF1:12 20 D6 0F 20 5F 10 20 A5
0CF9:EC 0F 20 0C 11 A0 03 B1 D3
0D01:05 D0 03 68 68 60 8D 0A A2
0D09:11 C8 B1 05 8D 0B 11 60 7F
0D11:20 CC 0C 20 C3 0D 8D 86 E5
0D19:1B 20 BB 0D 8D 87 1B 20 F1
0D21:EE 0D 20 BB 0D 20 BB 0D 23
0D29:4C 2F 0D 20 BB 0D 20 BB E6
0D31:0D AA 20 BB 0D 20 CD BD 7E
0D39:A9 20 20 D2 FF 20 BB 0D 66
0D41:C9 00 F0 1F A4 D4 D0 0B 75
0D49:C9 20 90 0A C9 80 90 03 77
0D51:20 9D 0E 20 D2 FF A5 CB 54
0D59:C9 3F F0 1F C9 40 D0 F6 20
0D61:4C 3E 0D A9 0D 20 D2 FF FB
0D69:20 BB 0D C9 00 D0 BC 20 9D
0D71:BB 0D C9 00 D0 B8 4C 7C 64
0D79:0D 68 68 A9 02 20 C3 FF F3
0D81:20 EC 0F 20 60 11 AD 18 85
0D89:08 8D 86 02 A9 00 85 D4 29
0D91:20 B0 0D A9 FA A2 16 20 D2
0D99:15 12 A5 CB C9 40 D0 FA 20
0DA1:A5 CB C9 40 F0 FA A5 CB 49
0DA9:C9 3F F0 FA 4C 22 09 A2 E5
0DB1:04 A9 0D 20 D2 FF CA D0 D8
0DB9:F8 60 A4 90 F0 2B C0 40 FB
0DC1:D0 B7 20 CB 10 68 8D 8A BA
0DC9:1B 68 8D 8B 1B 20 EC 0F 38
0DD1:AD 8B 1B 48 AD 8A 1B 48 A3
0DD9:A2 02 20 C6 FF 20 CF FF 56
0DE1:8D 0A 11 20 CF FF 8D 0B 0E
0DE9:11 20 CF FF 60 A9 55 A2 85
0DF1:1A 20 15 12 AD 86 1B AA 4D
0DF9:AD 87 1B 20 CD BD 20 B0 88
0E01:0D 60 20 CC 0C 20 B0 0D DB
0E09:18 A2 18 A0 06 20 F0 FF 79
0E11:A9 99 A2 1A 20 15 12 A2 7A
0E19:0E A9 20 20 D2 FF CA D0 A9
0E21:FA A9 A1 A2 1A 20 15 12 11
0E29:A0 02 A2 13 A9 2D 20 D2 B0
0E31:FF CA D0 FA 88 F0 0B A9 91
0E39:20 20 D2 FF 20 D2 FF 4C 60
0E41:2B 0E 20 C3 0D A2 13 4C 1C
0E49:8A 0E A2 00 48 C9 20 90 BC
0E51:04 C9 80 90 02 A9 2E 20 2E
0E59:D2 FF 68 20 94 13 9D D5 EF
0E61:07 A5 CB C9 3F D0 03 4C 10
0E69:7C 0D C9 40 D0 F3 AC 0A FD
0E71:11 D0 08 CE 0B 11 D0 03 79
0E79:4C 7C 0D 8E 8E 1B 20 BB 42
0E81:0D AE 8E 1B E8 E0 13 D0 15
0E89:C3 48 A9 0D 20 D2 FF AD 99
0E91:18 08 CA 9D D5 DB D0 FA A9
0E99:68 4C 4B 0E 38 E9 7F 8D 3D
0EA1:7F 1B A2 FF CE 7F 1B F0 34
0EA9:08 E8 BD 9E A0 10 FA 30 11
0EB1:F3 E8 BD 9E A0 30 06 20 95
0EB9:D2 FF 4C B2 0E 29 7F 60 68
0EC1:A0 00 AD 10 08 99 00 D8 64
0EC9:99 00 D9 99 00 DA 99 00 26
0ED1:DB 88 D0 F1 A0 27 AD 12 46
0ED9:08 99 E0 D9 88 D0 FA 60 F7
0EE1:20 46 0F AD 80 1B 85 FB D3
0EE9:85 FD CE 81 1B AD 81 1B E7
0EF1:85 FC 85 FE C6 FE A0 00 24
0EF9:A9 20 91 FB 91 FD 88 D0 4B
0F01:F9 A0 05 A2 00 20 1C 0F D6
0F09:A0 25 E8 20 1C 0F A0 A5 E3
0F11:E8 20 1C 0F A9 00 A0 02 B0
0F19:91 FB 60 BD CE 18 F0 07 A6
0F21:91 FB C8 E8 4C 1C 0F 60 FF
0F29:20 EB 14 20 CF FF 20 D2 68
0F31:FF 91 FB C8 CA D0 F4 AA ED
0F39:88 88 B1 FB A0 B0 91 FB 9A
0F41:8A C8 91 FB 60 AD 19 08 BC
0F49:8D 80 1B AD 1A 08 8D 81 1A
0F51:1B 60 AD 0E 08 8D 21 D0 35
0F59:AD 0D 08 8D 20 D0 AD 11 1C
0F61:08 8D 86 02 18 A2 02 A0 C7
0F69:00 20 F0 FF A9 15 A2 19 AD
0F71:20 15 12 18 A2 0D A0 00 33
0F79:20 F0 FF A9 D5 A2 19 20 0A
0F81:15 12 60 18 AD 80 1B 85 67
0F89:FB AD 81 1B 85 FC A2 02 5A
0F91:20 C6 FF A0 00 20 A5 FF 47
0F99:91 FB C0 01 D0 08 8D 0B 74
0FA1:11 29 0F 8D 20 D0 C8 D0 F3
0FA9:EC EE 81 1B 60 A9 20 A0 66
0FB1:00 20 CE 0F 20 CE 0F C6 C3
0FB9:FC A2 23 A0 47 20 1C 0F 6F
0FC1:A0 67 E8 20 1C 0F A0 87 0F
0FC9:E8 20 1C 0F 60 E6 FC 91 03
0FD1:FB C8 D0 FB 60 18 A9 0F BF
0FD9:A2 08 A8 20 BA FF A9 00 8B
0FE1:20 BD FF 20 C0 FF 90 12 BA
0FE9:4C 2D 11 A2 0F 20 C6 FF 4C
0FF1:20 CF FF C9 30 D0 04 20 9D
0FF9:CC FF 60 8D 86 1B 20 CF 14
1001:FF 8D 87 1B A9 13 20 D2 D3
1009:FF AD 14 08 8D 86 02 AC CE
1011:86 1B C0 32 D0 1C AC 87 4E
1019:1B C0 36 D0 0A A9 51 A2 07
1021:17 20 15 12 4C 33 10 C0 A8
1029:31 D0 07 A9 3F A2 17 20 64
1031:15 12 AD 86 1B 20 D2 FF 7D
1039:AD 87 1B 20 D2 FF 20 CF 1E
1041:FF 20 D2 FF C9 0D D0 F6 DE
1049:20 CC FF 20 60 11 20 C3 F9
1051:11 68 68 AD 7A 1B D0 03 E0
1059:4C 1B 08 4C 17 09 18 A2 DB
1061:0F 20 C9 FF 90 03 4C 2D A0
1069:11 A9 49 20 D2 FF A9 30 C1
1071:20 D2 FF 20 CC FF 60 AD 2D
1079:0F 08 8D 86 02 A9 93 20 3B
1081:D2 FF 18 A2 06 A0 08 20 1B
1089:F0 FF A9 B8 A2 17 20 15 A9
1091:12 AD 14 08 8D 86 02 A2 56
1099:04 A0 06 A9 00 20 2E 12 2E
10A1:A2 08 A0 21 A9 A6 20 2E 91
10A9:12 20 D6 0F 18 A2 0F 20 30
10B1:C9 FF 90 03 4C 2D 11 A9 DB
10B9:56 20 D2 FF A9 30 20 D2 88
10C1:FF 20 CC FF 20 EC 0F 4C A2
10C9:BD 16 18 AE 0A 11 F0 30 E2
10D1:A2 0F 20 C9 FF 90 03 4C 3C
10D9:2D 11 A2 00 BD 02 11 F0 32
10E1:07 20 D2 FF E8 4C DD 10 2C
10E9:A9 00 AE 0A 11 20 CD BD B7
10F1:A9 2C 20 D2 FF A9 00 AE 78
10F9:0B 11 20 CD BD 20 CC FF CC
1101:60 55 31 3A 32 2C 30 2C 41
1109:00 12 FF 18 A9 02 A0 11 D8
1111:A2 2B 20 BD FF A9 02 A2 7C
1119:08 A0 02 20 BA FF 20 C0 80
1121:FF 90 03 4C 2D 11 20 CC 47
1129:FF 60 23 0D 48 20 60 11 2D
1131:AD 14 08 8D 86 02 A9 08 A0
1139:A2 17 20 15 12 18 68 69 F2
1141:30 20 D2 FF C9 35 D0 07 A9
1149:A9 15 A2 17 20 15 12 20 E4
1151:C3 11 68 68 AD 7A 1B F0 AB
1159:03 4C 22 09 4C 1B 08 A9 6D
1161:02 20 C3 FF A9 0F 20 C3 92
1169:FF 60 48 A9 7F C5 91 F0 6E
1171:02 68 60 68 A9 93 20 D2 EF
1179:FF 18 A2 06 A0 00 20 F0 8C
1181:FF A9 0E 8D 20 D0 8D 86 8E
1189:02 A9 06 8D 21 D0 A9 94 E4
1191:A2 17 20 15 12 4C C2 16 7D
1199:A9 20 A0 00 99 00 04 C8 4A
11A1:C0 50 D0 F8 60 A2 18 A0 40
11A9:00 20 F0 FF A9 20 A0 28 29
11B1:99 BF 07 88 D0 FA 60 A0 CD
11B9:15 A9 20 99 E0 05 88 D0 6B
11C1:FA 60 20 A6 11 18 A0 00 12
11C9:A2 18 20 F0 FF A0 00 8C 65
11D1:86 1B A5 CB C9 40 D0 FA 5B
11D9:B9 FA 16 C9 00 F0 07 20 E8
11E1:D2 FF C8 4C D9 11 A2 9B 3F
11E9:A0 FF 88 C0 00 D0 FB A5 5A
11F1:CB C9 40 D0 18 CA E0 00 2F
11F9:D0 EE AD 86 1B F0 03 4C 4D
1201:C3 11 A9 01 8D 86 1B 20 6D
1209:A6 11 4C E7 11 20 99 11 1A
1211:20 A6 11 60 A0 00 8D 1E 55
1219:12 8E 1F 12 B9 D1 17 F0 23
1221:07 20 D2 FF C8 4C 1D 12 EE
1229:A9 00 85 D4 60 C9 00 D0 1B
1231:07 8E 8E 1B 8C 8F 1B 60 39
1239:8E 90 1B 8C 91 1B 8D 92 9B
1241:1B AE 8E 1B AC 8F 1B 4C 48
1249:4C 12 E8 18 20 F0 FF AD 29
1251:92 1B 20 D2 FF EC 90 1B A6
1259:D0 F0 CC 91 1B F0 04 C8 42
1261:4C 4C 12 CA 18 20 F0 FF D0
1269:AD 92 1B 20 D2 FF EC 8E 6D
1271:1B D0 F0 CC 8F 1B F0 04 11
1279:88 4C 65 12 60 AD 12 08 A8
1281:8D 86 02 AD 80 1B 85 FD A2
1289:AD 81 1B 85 FE A9 50 85 65
1291:FB A9 04 85 FC 18 A5 FB 86
1299:69 11 90 02 E6 FC 85 FB 1B
12A1:A2 01 A0 02 B1 FD F0 08 FA
12A9:C9 05 90 09 C9 BF B0 0A 4F
12B1:A9 20 4C BD 12 A9 2A 4C EF
12B9:BD 12 A9 3C A0 16 91 FB B6
12C1:E0 0B D0 03 20 30 13 A0 EB
12C9:02 B1 FD C9 00 F0 31 A0 7E
12D1:14 B1 FD C9 A0 D0 08 A9 CA
12D9:20 91 FB 88 4C D2 12 20 6C
12E1:94 13 91 FB C0 14 F0 06 45
12E9:C8 A9 22 91 FB 88 C0 05 C2
12F1:D0 03 4C 11 13 88 B1 FD F5
12F9:20 94 13 91 FB 4C EF 12 D1
1301:A0 05 B1 FD 20 94 13 09 51
1309:80 91 FB C8 C0 15 D0 F2 CE
1311:18 A5 FB 69 28 90 02 E6 31
1319:FC 85 FB 18 A5 FD 69 20 38
1321:90 02 E6 FE 85 FD E8 E0 B3
1329:17 F0 03 4C A3 12 60 A0 03
1331:11 A9 20 99 E0 05 88 D0 E4
1339:FA A0 02 B1 FD 29 1F 8D C0
1341:86 1B 0A 6D 86 1B AA A0 20
1349:00 BD 6A 1B 29 3F 99 F1 49
1351:05 C8 E8 C0 03 D0 F2 18 AE
1359:A0 01 A2 0C 20 F0 FF A0 8A
1361:1E B1 FD AA C8 B1 FD 20 96
1369:CD BD 18 A0 07 A2 0C 20 ED
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1371:F0 FF A0 03 B1 FD AA A9 D8
1379:00 20 CD BD 18 A0 0C A2 3B
1381:0C 20 F0 FF A0 04 B1 FD 4A
1389:AA A9 00 20 CD BD A0 00 18
1391:A2 0B 60 30 1B C9 3F B0 0A
1399:09 C9 1F B0 22 09 80 4C 28
13A1:C0 13 C9 5F B0 05 29 3F 47
13A9:4C C0 13 25 1F 4C C0 13 99
13B1:C9 A0 F0 0C C9 BF B0 05 77
13B9:29 3F 4C C0 13 29 7F 60 76
13C1:A9 22 60 AD 19 08 85 FB 1C
13C9:AD 1A 08 85 FC A0 02 B1 C6
13D1:FB C9 20 F0 12 C9 00 F0 24
13D9:12 A5 FB 18 69 20 90 02 62
13E1:E6 FC 85 FB 4C CE 13 20 0F
13E9:33 0A 60 A5 FB 85 FD A5 2A
13F1:FC 85 FE B1 FD C9 20 F0 3B
13F9:EE C9 00 D0 0E A5 FD 18 32
1401:69 20 90 02 E6 FE 85 FD 54
1409:4C F4 13 20 12 14 4C CE 41
1411:13 A0 02 B1 FB 48 B1 FD A8
1419:91 FB 68 91 FD C8 C0 20 E3
1421:D0 F1 60 AD 7C 1B C9 00 F8
1429:F0 03 20 5B 14 AD 80 1B B7
1431:38 E9 20 B0 03 CE 81 1B 70
1439:8D 80 1B 4C 7E 12 EA AD 30
1441:7C 1B C9 00 F0 03 20 85 01
1449:14 AD 80 1B 18 69 20 90 DF
1451:03 EE 81 1B 8D 80 1B 4C 89
1459:7E 12 AD 81 1B 85 06 E6 F4
1461:06 AD 80 1B 18 69 20 90 F0
1469:02 E6 06 85 05 18 AD 81 CA
1471:1B 85 04 E6 04 AD 80 1B 6A
1479:18 69 40 90 02 E6 04 85 52
1481:03 4C AC 14 AD 81 1B 85 44
1489:06 E6 06 AD 80 1B 18 69 14
1491:60 90 02 E6 06 85 05 18 25
1499:AD 81 1B 85 04 E6 04 AD 26
14A1:80 1B 18 69 40 90 02 E6 99
14A9:04 85 03 A0 02 B1 05 48 C8
14B1:B1 03 91 05 68 91 03 C8 4E
14B9:C0 20 D0 F1 60 18 AD 80 C2
14C1:1B 85 FB AD 81 1B 85 FC B3
14C9:A2 02 20 C9 FF A0 00 B1 98
14D1:FB 20 A8 FF C0 01 D0 08 C8
14D9:8D 0B 11 29 0F 8D 20 D0 FF
14E1:C8 D0 EC EE 81 1B 20 CC B4
14E9:FF 60 A9 12 8D 0A 11 A9 E0
14F1:00 8D 0B 11 20 CB 10 A9 E9
14F9:31 8D 44 15 A9 34 8D 45 76
1501:15 8D 46 15 A9 00 8D 47 E2
1509:15 20 21 15 A2 02 20 C6 5F
1511:FF A2 14 A0 65 60 A9 30 A0
1519:8D 44 15 A9 00 8D 45 15 2E
1521:18 A2 0F 20 C9 FF 90 03 56
1529:4C 2D 11 A2 00 BD 3E 15 99
1531:F0 07 20 D2 FF E8 4C 2E 31
1539:15 20 CC FF 60 42 2D 50 46
1541:3A 32 2C 31 34 34 00 00 20
1549:18 A2 0F 20 C9 FF 90 03 7E
1551:4C 2D 11 A2 00 BD 6E 15 22
1559:F0 07 20 D2 FF E8 4C 56 81
1561:15 A9 00 AE 79 15 20 CD 99
1569:BD 20 CC FF 60 55 32 3A 0B
1571:32 2C 30 2C 31 38 2C 00 4B
1579:00 AD 11 08 8D 20 D0 AD ED
1581:0B 16 49 01 8D 0B 16 F0 A5
1589:06 20 C4 13 4C DC 15 20 A8
1591:24 0A 20 C4 13 A5 FD 85 51
1599:FB A5 FE 85 FC 20 24 0A 1E
15A1:4C DC 15 A5 FB 85 FD A5 BD
15A9:FC 85 FE A0 02 B1 FB C9 36
15B1:00 F0 04 C9 20 D0 0D AD 41
15B9:0D 08 8D 20 D0 A5 CB C9 9E
15C1:40 D0 FA 60 38 A5 FD E9 E3
15C9:20 B0 02 C6 FE 85 FD A0 87
15D1:02 B1 FD C9 00 F0 04 C9 5B
15D9:20 D0 0E 38 A5 FB E9 20 9E
15E1:B0 02 C6 FC 85 FB 4C A4 E6
15E9:15 A0 05 38 B1 FD D1 FB 10
15F1:D0 04 C8 4C EC 15 29 7F F0
15F9:8D 86 1B B1 FB 29 7F CD 5C
1601:86 1B B0 C0 20 12 14 4C 17
1609:C5 15 00 20 D6 0F 20 5F F1
1611:10 20 EC 0F EE 20 D0 20 95
1619:0C 11 20 46 0F AD 80 1B 43
1621:85 FB CE 81 1B AD 81 1B AE
1629:85 FC 20 EB 14 CE 20 D0 07
1631:A9 13 20 D2 FF AD 15 08 11
1639:8D 86 02 20 CF FF 20 D2 A1
1641:FF D1 FB F0 16 AD 14 08 08
1649:8D 86 02 20 60 11 A9 79 34
1651:A2 17 20 15 12 20 C3 11 93
1659:4C 22 09 C8 CA D0 DC 20 55
1661:46 0F 20 17 15 20 EC 0F FB
1669:20 6B 11 A9 01 8D 79 15 83
1671:20 BE 14 20 49 15 20 EC AD
1679:0F AD 0B 11 8D 79 15 C9 51
1681:FF D0 ED 20 60 11 AD 0D 51
1689:08 8D 20 D0 AD 7D 1B D0 98
1691:28 AD 14 08 8D 86 02 A9 74
1699:93 20 D2 FF 18 A2 0C A0 F5
16A1:0C 20 F0 FF A9 A8 A2 17 46
16A9:20 15 12 A5 CB C9 40 F0 BE
16B1:FA C9 27 F0 07 C9 19 D0 24
16B9:F2 20 78 10 A9 93 20 D2 26
16C1:FF A9 0E 8D 20 D0 8D 86 D8
16C9:02 A9 06 8D 21 D0 A2 0C 98
16D1:A0 0E A9 00 20 2E 12 A2 87
16D9:10 A0 19 A9 A6 20 2E 12 18
16E1:18 A2 0E A0 10 20 F0 FF 71
16E9:A9 D1 A2 17 20 15 12 20 BE
16F1:60 11 A9 00 85 C6 4C 7B 23
16F9:E3 50 52 45 53 53 20 41 34
1701:4E 59 20 4B 45 59 00 13 08
1709:49 2F 30 20 20 45 52 52 BC
1711:4F 52 20 00 20 20 44 45 CE
1719:56 49 43 45 20 4E 4F 54 AE
1721:20 50 52 45 53 45 4E 54 B2
1729:2E 2E 0D 54 55 52 4E 20 91
1731:44 49 53 4B 20 44 52 49 F2
1739:56 45 20 4F 4E 00 4E 4F 3B
1741:20 44 49 53 4B 20 49 4E AA
1749:20 44 52 49 56 45 0D 00 59
1751:52 45 4D 4F 56 45 20 41 E1
1759:4E 59 20 57 52 49 54 45 24
1761:2D 50 52 4F 54 45 43 54 0C
1769:20 54 41 42 20 46 52 4F 17
1771:4D 20 44 49 53 4B 0D 00 4D
1779:13 11 59 4F 55 20 48 41 92
1781:56 45 20 53 57 49 54 43 31
1789:48 45 44 20 44 49 53 4B F0
1791:53 21 00 93 11 11 53 54 B2
1799:4F 50 20 4B 45 59 20 50 5C
17A1:52 45 53 53 45 44 00 56 7B
17A9:41 4C 49 44 41 54 45 3F 1E
17B1:20 20 20 59 2F 4E 00 56 9A
17B9:41 4C 49 44 41 54 49 4E 45
17C1:47 2E 2E 2E 50 4C 45 41 47
17C9:53 45 20 57 41 49 54 00 44
17D1:44 4F 4E 45 2E 2E 11 11 71
17D9:11 00 50 52 45 53 53 20 FD
17E1:12 31 92 20 50 52 47 20 34
17E9:20 4F 52 20 20 12 32 92 88
17F1:20 53 45 51 4F 52 20 20 E6
17F9:3C 52 45 54 55 52 4E 3E 97
1801:20 20 54 4F 20 20 43 41 12
1809:4E 43 45 4C 00 13 20 20 4B
1811:2A 54 4F 20 43 41 4E 43 56
1819:45 4C 20 55 53 45 0D 53 75
1821:48 49 46 54 45 44 20 3C 8D
1829:52 45 54 55 52 4E 3E 2A 26
1831:20 20 20 5E 2D 2D 2D 4E 2A
1839:45 57 20 4E 41 4D 45 2D C1
1841:2D 2D 5E 00 13 59 4F 55 11
1849:20 4D 55 53 54 20 12 4F 53
1851:92 46 46 4C 4F 43 4B 20 28
1859:42 45 46 4F 52 45 20 59 FA
1861:4F 55 20 43 41 4E 20 12 5C
1869:53 92 43 52 41 54 43 48 9F
1871:00 13 59 4F 55 20 4D 55 A1
1879:53 54 20 55 53 45 20 12 C3
1881:44 92 45 4C 45 54 45 20 0C
1889:54 4F 20 52 45 4D 4F 56 35
1891:45 20 55 4E 43 4C 4F 53 39
1899:45 44 0D 46 49 4C 45 53 DC
18A1:20 28 2A 29 20 4F 52 20 C6
18A9:43 4F 4D 4D 41 20 28 2C D4
18B1:29 20 46 49 4C 45 53 00 F9
18B9:13 20 4E 41 4D 45 20 45 5E
18C1:58 49 53 54 53 20 45 52 18
18C9:52 4F 52 21 00 44 49 52 49
18D1:45 43 54 4F 52 59 20 20 4D
18D9:4D 41 47 49 43 00 44 49 6A
18E1:53 4B 20 4E 41 4D 45 2E 6F
18E9:2E 00 49 44 2E 20 23 00 D6
18F1:52 45 4D 45 4D 42 45 52 EA
18F9:20 54 4F 00 43 54 52 4C 95
1901:20 46 20 57 48 45 4E 00 42
1909:59 4F 55 27 52 45 20 44 05
1911:4F 4E 45 00 20 55 50 20 3E
1919:20 20 12 46 35 92 20 20 5E
1921:44 4F 57 4E 20 12 46 37 26
1929:92 0D 20 47 52 41 42 20 9C
1931:12 46 31 92 20 20 44 52 A9
1939:4F 50 20 12 46 33 92 0D 7D
1941:20 12 4F 92 46 46 4C 4F 4E
1949:43 4B 20 20 12 4C 92 4F 2C
1951:43 4B 0D 20 12 44 92 45 A7
1959:4C 45 54 45 20 20 20 12 B5
1961:55 92 4E 53 43 52 41 54 1C
1969:43 48 0D 20 12 43 92 48 FD
1971:41 4E 47 45 20 20 20 12 E8
1979:52 92 45 41 44 20 50 52 CB
1981:47 0D 20 12 49 92 4E 53 44
1989:50 45 43 54 20 53 45 51 0D
1991:20 46 49 4C 45 53 0D 20 05
1999:12 4D 92 4F 56 45 20 41 B8
19A1:4C 4C 20 44 45 4C 53 20 77
19A9:44 4F 57 4E 0D 20 12 53 02
19B1:48 49 46 54 92 20 12 4D EE
19B9:92 4F 56 45 20 44 45 4C 11
19C1:53 20 55 50 0D 20 12 41 A3
19C9:92 4C 50 48 41 42 45 54 D8
19D1:49 5A 45 00 42 4C 4B 53 15
19D9:20 20 54 52 4B 20 20 53 42
19E1:45 43 0D 0D 20 12 20 20 A3
19E9:49 4D 4D 45 44 49 41 54 30
19F1:45 20 20 20 92 0D 20 12 EF
19F9:20 44 49 53 4B 20 41 43 4C
1A01:54 49 4F 4E 53 20 92 0D CD
1A09:0D 20 12 43 4F 4E 54 52 F0
1A11:4F 4C 92 20 12 53 92 43 9A
1A19:52 41 54 43 48 0D 20 12 4E
1A21:43 4F 4E 54 52 4F 4C 92 D4
1A29:20 12 46 92 49 4E 49 53 4D
1A31:48 45 44 0D 0D 20 4C 4F 05
1A39:43 4B 45 44 20 46 49 4C C7
1A41:45 20 3D 20 3C 0D 20 55 75
1A49:4E 43 4C 4F 53 45 44 20 4C
1A51:3D 20 2A 00 20 50 52 4F A7
1A59:47 52 41 4D 20 2D 2D 20 F2
1A61:53 54 41 52 54 53 20 41 13
1A69:54 20 00 20 12 53 54 4F A7
1A71:50 92 20 54 4F 20 53 54 B1
1A79:4F 50 20 20 20 4F 52 20 72
1A81:41 4E 59 20 4B 45 59 20 59
1A89:54 4F 20 2D 2D 50 41 55 15
1A91:53 45 2D 2D 11 11 11 00 28
1A99:12 41 53 43 49 49 92 00 5A
1AA1:12 53 43 52 45 45 4E 2D 4A
1AA9:50 4F 4B 45 92 0D 00 9D FD
1AB1:49 4E 53 45 52 54 20 44 45
1AB9:49 53 4B 20 49 4E 20 44 DA
1AC1:52 49 56 45 0D 0D 12 4E 9F
1AC9:4F 54 45 92 3A 20 54 48 CF
1AD1:49 53 20 50 52 4F 47 52 39
1AD9:41 4D 20 57 49 4C 4C 20 AF
1AE1:41 55 54 4F 4D 41 54 49 EC
1AE9:43 41 4C 4C 59 0D 56 41 4B
1AF1:4C 49 44 41 54 45 20 41 74
1AF9:46 54 45 52 20 12 43 4F 53
1B01:4E 54 52 4F 4C 92 20 12 B1
1B09:46 92 20 28 46 49 4E 49 CA
1B11:53 48 45 44 29 20 49 46 92
1B19:0D 59 4F 55 20 48 41 56 66
1B21:45 20 55 53 45 44 20 12 6F
1B29:44 92 45 4C 45 54 45 20 B9
1B31:28 44 45 4C 41 59 45 44 38
1B39:29 20 4F 52 0D 12 55 92 09
1B41:4E 53 43 52 41 54 43 48 2B
1B49:20 42 55 54 20 4E 4F 54 3D
1B51:20 12 53 92 43 52 41 54 E9
1B59:43 48 20 28 49 4D 4D 45 29
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1B61:44 49 41 54 45 29 2E 20 C4
1B69:00 44 45 4C 53 45 51 50 C0
1B71:52 47 55 53 52 52 45 4C 35
1B79:03 38 00 00 00 00 00 00 3F
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," elsewhere in this issue.

SpeedScript 128

See instructions in article on page 22 before typing in.

Program 1: *SpeedScript 128*

```
1C01:0B 1C 0A 00 9E 37 31 38 73
1C09:31 00 00 00 78 20 84 FF 27
1C11:58 A9 C0 8D 04 0A A9 0B 77
1C19:8D 11 D0 A9 00 8D 0A 35 90
1C21:8D 16 35 8D 0C 35 8D 0E 83
1C29:35 8D 10 35 8D 96 35 8D 73
1C31:B5 35 A9 04 8D 0B 35 A9 B3
1C39:CF 8D 0D 35 A9 D0 8D 0F 6C
1C41:35 A9 FF 8D 11 35 8D 94 64
1C49:35 A9 93 20 D2 FF A9 0E F2
1C51:20 D2 FF A9 0B 20 D2 FF 67
1C59:A9 02 85 E5 AD E6 21 85 C6
1C61:F1 20 C4 21 A9 0E 8D 00 E5
1C69:FF 20 1C 1D A9 CB CD 53 6A
1C71:38 8D 53 38 F0 06 20 D6 CD
1C79:1D 20 AB 22 20 2F 1E A0 7A
1C81:00 B9 95 1C F0 0B 99 0A 8D
1C89:10 A9 01 99 00 10 C8 D0 90
1C91:F0 4C F8 1E 85 89 86 8A 40
1C99:87 8B 88 8C 83 1B 00 A5 80
1CA1:26 85 50 A5 27 85 51 A5 4A
1CA9:9E 85 24 A5 9F 85 25 A6 75
1CB1:B5 F0 19 A9 00 85 54 A0 1E
1CB9:00 20 90 02 C8 C4 54 D0 FE
1CC1:F8 E6 51 E6 25 E0 00 F0 66
1CC9:07 CA D0 E7 A5 B4 D0 E5 58
1CD1:60 A5 B5 AA 05 B4 D0 01 A2
1CD9:60 18 8A 65 27 85 51 A5 87
1CE1:26 85 50 18 8A 65 9F 85 C8
1CE9:25 A5 9E 85 24 E8 A4 B4 0D
1CF1:D0 04 F0 0A A0 FF 20 90 28
1CF9:02 88 C0 FF D0 F8 C6 51 B6
1D01:C6 25 CA D0 EF 60 8E 00 6C
1D09:D6 D0 07 48 A9 1F 8D 00 2D
1D11:D6 68 2C 00 D6 10 FB 8D D2
1D19:01 D6 60 A9 91 8D BA 03 6B
1D21:A9 0E 8D 04 D5 A0 0A B9 A4
1D29:32 1D 99 90 02 88 10 F7 4A
1D31:60 8D 02 FF B1 50 91 24 55
1D39:8D 04 FF 60 A9 B1 8D BA 2B
1D41:03 A9 24 8D BB 03 A9 00 02
1D49:8D B2 03 A9 41 8D 04 D5 10
1D51:60 A9 A0 85 0C 20 F5 27 86
1D59:C6 0C AD 13 35 85 FB AD 46
1D61:14 35 85 FC A9 FB 8D B2 7E
1D69:03 A2 02 AC 7D 27 20 AE 50
1D71:03 29 7F C9 1F F0 0A C9 9E
1D79:20 F0 06 88 D0 F0 AC 7D 6A
1D81:27 C8 84 3B A0 00 20 AE B9
1D89:03 20 0C 1D C8 29 7F C9 54
1D91:1F F0 04 C4 3B D0 EF 18 79
1D99:98 65 FB 85 FB A5 FC 69 2B
1DA1:00 85 FC E0 02 D0 03 8C D0
1DA9:12 35 20 C9 1D E8 E0 19 42
1DB1:F0 03 4C 6C 1D A5 FB 8D 7A
1DB9:1B 35 A5 FC 8D 1C 35 A9 44
1DC1:29 8D B2 03 8D BB 03 60 3C
1DC9:C0 50 F0 08 A9 20 20 0C 31
1DD1:1D C8 D0 F4 60 AD 0A 35 39
1DD9:85 FB 8D 13 35 8D 18 35 FD
1DE1:85 29 AD 0B 35 85 FC 8D D6
1DE9:14 35 8D 19 35 85 2A A9 7C
1DF1:FB 8D BB 03 38 AD 0D 35 FC
1DF9:ED 0B 35 AA A9 20 A0 FF 4E
1E01:C6 FC 20 B7 03 C8 E6 FC 65
1E09:20 B7 03 C8 D0 FA E6 FC 6D
1E11:CA D0 F5 20 B7 03 60 85 B7
1E19:3B 84 3C A0 00 B1 3B F0 D3
1E21:06 20 0C 1D C8 D0 F6 60 93
1E29:20 E4 FF F0 FB 60 A9 0E 80
1E31:8D 00 FF 20 1C 1D A9 79 58
1E39:8D 18 03 A9 1E 8D 19 03 99
1E41:A9 00 85 9D 20 2E 26 AD 90
1E49:0A 35 85 29 AD 0B 35 85 A4
1E51:2A 20 69 1E A9 0D A0 33 AF
1E59:20 18 1E A9 FB A0 34 20 F4
1E61:18 1E EE 15 35 4C 55 20 06
1E69:20 CB 1E A9 F9 A0 32 20 DD
1E71:18 1E A9 00 8D 15 35 60 02
1E79:D8 A9 7F 8D 0D DD AC 0D 9B
1E81:DD 10 03 4C 5F FA A5 FA 03
1E89:F0 0C A9 29 8D BB 03 A5 10
1E91:09 A0 00 20 B7 03 20 F5 7C
1E99:27 A9 20 20 71 26 20 CB 0A
1EA1:1E A9 DE A0 34 20 18 1E AD
1EA9:20 6F 25 D0 11 20 3D 1D 24
1EB1:A9 00 8D 00 FF 78 A9 01 AA
1EB9:8D 04 0A 4C 53 FA 20 95 20
1EC1:26 A2 FA 9A 20 2F 1E 4C 09
1EC9:F8 1E A9 00 A8 20 9A 26 60
1ED1:20 C9 1D AD 16 35 F0 0E 84
1ED9:A9 44 85 0C 20 F5 27 A9 3E
1EE1:EF A0 34 20 18 1E A9 00 53
1EE9:4C 9A 26 48 29 80 4A 85 A1
1EF1:3B 68 29 3F 05 3B 60 A0 75
1EF9:00 84 FA A9 29 8D B2 03 39
1F01:8D BB 03 20 AE 03 85 09 EC
1F09:A0 00 20 AE 03 49 80 20 E4
1F11:B7 03 A5 FA 49 01 85 FA A4
1F19:20 52 1D 20 E4 FF D0 0D 77
1F21:A5 A2 29 10 F0 F5 A9 05 B8
1F29:85 A2 4C 09 1F AA A0 00 D1
1F31:A5 09 20 B7 03 E0 5F D0 2F
1F39:0D 20 14 21 A9 20 A0 00 A9
1F41:20 B7 03 4C F8 1E AD 15 53
1F49:35 F0 07 8A 48 20 69 1E 9B
1F51:68 AA 8A C9 0D D0 02 A2 AE
1F59:5F 8A 29 7F C9 20 90 59 50
1F61:E0 A0 D0 02 A2 20 8A 48 65
1F69:A0 00 20 AE 03 C9 1F F0 55
1F71:05 AD 16 35 F0 03 20 FA 82
1F79:24 68 20 EC 1E A0 00 48 72
1F81:20 C0 1D 68 20 B7 03 C9 D9
1F89:1F D0 03 20 52 1D 38 A5 0B
1F91:29 ED 18 35 85 3B A5 2A C4
1F99:ED 19 35 05 3B 90 0E A5 E9
1FA1:29 69 00 8D 18 35 A5 2A B2
1FA9:69 00 8D 19 35 E6 29 D0 48
1FB1:02 E6 2A 20 55 20 4C F8 AE
1FB9:1E 8A AE DC 1F DD DC 1F 96
1FC1:F0 06 CA D0 F8 4C F8 1E 69
1FC9:CA 8A 0A AA A9 1E 48 A9 FB
1FD1:F7 48 BD 06 20 48 BD 05 D8
1FD9:20 48 60 28 1D 9D 89 85 C0
1FE1:02 0C 8A 86 14 94 04 13 EB
1FE9:1B 93 87 8B 05 88 8C 16 BD
1FF1:91 11 9F 12 18 1A 10 1C B7
1FF9:1E 06 01 0B 08 1F 09 83 EB
2001:0A 8D 07 17 0A 21 13 21 18
2009:1E 21 5B 21 C0 21 D2 21 6F
2011:E6 21 54 22 90 23 F9 24 E2
2019:C3 23 02 24 63 25 86 25 68
2021:A7 25 CC 25 A4 26 5F 28 0F
2029:38 28 96 28 E6 21 54 22 6B
2031:05 29 1D 2A B1 2A A4 21 25
2039:55 2B C6 28 03 30 AB 23 9D
2041:D6 2A AA 22 9B 30 AE 32 1C
2049:AC 24 A4 24 49 31 D9 24 A6
2051:7A 30 3A 27 20 B3 20 38 DC
2059:A5 29 ED 13 35 A5 2A ED 28
2061:14 35 B0 20 38 AD 13 35 E4
2069:ED 0A 35 85 3B AD 14 35 10
2071:ED 0B 35 05 3B F0 0D A5 BF
2079:29 8D 13 35 A5 2A 8D 14 6C
2081:35 20 52 1D 38 AD 1B 35 64
2089:E5 29 85 FB AD 1C 35 E5 A5
2091:2A 85 FC 05 FB F0 02 B0 90
2099:18 18 AD 13 35 6D 12 35 8B
20A1:8D 13 35 AD 14 35 69 00 37
20A9:8D 14 35 20 52 1D 4C 85 83
20B1:20 60 38 AD 18 35 ED 0C 79
20B9:35 85 3B AD 19 35 ED 0D BE
20C1:35 05 3B 90 0C AD 0C 35 B2
20C9:8D 18 35 AD 0D 35 8D 19 C9
20D1:35 38 A5 29 ED 0A 35 85 89
20D9:3B A5 2A ED 0B 35 05 3B B7
20E1:B0 0B AD 0A 35 85 29 AD 53
20E9:0B 35 85 2A 60 38 A5 29 A8
20F1:ED 18 35 85 3B A5 2A ED E0
20F9:19 35 05 3B B0 01 60 AD 60
2101:18 35 85 29 AD 19 35 85 A1
2109:2A 60 E6 29 D0 02 E6 2A 6E
2111:4C 55 20 A5 29 D0 02 C6 84
2119:2A C6 29 4C 55 20 A5 29 AB
2121:85 FB A5 2A 85 FC C6 FC 27
2129:A0 FF A9 FB 8D B2 03 20 0E
2131:AE 03 C9 20 F0 04 C9 1F 11
2139:D0 03 88 D0 F2 20 AE 03 3B
2141:C9 20 F0 08 C9 1F F0 04 BF
2149:88 D0 F2 60 38 98 65 FB 53
2151:85 29 A5 FC 69 00 85 2A A5
2159:4C 55 20 A0 00 20 C0 1D 44
2161:20 AE 03 C9 20 F0 08 C9 FA
2169:1F F0 04 C8 D0 F2 60 C8 60
2171:D0 0B E6 2A A5 2A CD 19 E8
2179:35 90 02 D0 1A 20 AE 03 79
2181:C9 20 F0 EB C9 1F F0 E7 22
2189:18 98 65 29 85 29 A5 2A 83
2191:69 00 85 2A 4C 55 20 AD 81
2199:18 35 85 29 AD 19 35 85 3A
21A1:2A 4C 55 20 A9 00 8D 13 34
21A9:35 AD 19 35 38 E9 04 CD A7
21B1:0B 35 B0 03 AD 0B 35 8D 9E
21B9:14 35 20 52 1D 4C 98 21 E8
21C1:EE D2 21 AD D2 21 29 0F AB
21C9:8D D2 21 A2 1A 20 07 1D 52
21D1:60 00 EE E6 21 AD E6 21 3F
21D9:29 0F 8D E6 21 85 F1 20 B7
21E1:2E 26 4C 52 1D 0F A5 29 0D
21E9:85 FB A5 2A 85 FC C6 FC EF
21F1:A0 FF A9 FB 8D B2 03 20 D6
21F9:AE 03 C9 2E F0 0C C9 21 DC
2201:F0 08 C9 3F F0 04 C9 1F 37
2209:D0 04 88 D0 EA 60 20 AE 9C
2211:03 C9 2E F0 1B C9 21 F0 51
2219:17 C9 3F F0 13 C9 1F F0 41
2221:0F 88 D0 EA C6 FC A5 FC 4A
2229:CD 0A 35 B0 E1 4C 48 22 7B
2231:84 3B C6 3B C8 F0 0B 20 53
2239:AE 03 C9 20 F0 F6 88 4C 91
2241:4D 21 A4 3B 4C 0F 22 AD 4D
2249:0A 35 85 29 AD 0B 35 85 AC
2251:2A 4C 55 20 A0 00 A9 29 EB
2259:8D B2 03 20 AE 03 C9 2E B6
2261:F0 1D C9 21 F0 19 C9 3F 6F
2269:F0 15 C9 1F F0 11 C8 D0 C4
2271:EA E6 2A A5 2A CD 19 35 74
2279:F0 E1 90 DF 4C 98 21 C8 8E
2281:D0 0E E6 2A A5 2A CD 19 BB
2289:35 90 05 F0 03 4C 98 21 D7
2291:20 AE 03 C9 20 F0 E8 C9 EE
2299:2E F0 E4 C9 21 F0 E0 C9 C2
22A1:3F F0 DC C9 1F F0 D8 4C B4
22A9:89 21 AD 0E 35 8D 72 35 8B
22B1:AD 0F 35 8D 73 35 20 CB 8C
22B9:1E A9 21 A0 33 20 18 1E 0E
22C1:A9 01 8D 15 35 60 38 A5 5F
22C9:29 ED 0A 35 85 3B A5 2A 41
22D1:ED 0B 35 05 3B D0 03 68 52
22D9:68 60 A5 29 85 26 A5 2A EB
22E1:85 27 60 38 A5 29 85 9E BD
22E9:49 FF 65 26 8D 76 35 A5 38
22F1:2A 85 9F 49 FF 65 27 8D A6
22F9:77 35 A5 26 8D 78 35 A5 BC
2301:27 8D 79 35 A5 9E 8D 7A FD
2309:35 85 26 A5 9F 8D 7B 35 C9
2311:85 27 38 AD 77 35 6D 73 A4
2319:35 CD 11 35 90 14 20 CB C3
2321:1E A9 30 A0 33 20 18 1E 59
2329:A9 01 8D 15 35 A9 00 85 5D
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3101:02 B0 36 E8 EC 96 35 D0 E2
3109:DB 18 98 65 FB 85 3B A5 DA
3111:FC 69 00 85 3C AD 18 35 A2
3119:C5 3B AD 19 35 E5 3C 90 BE
3121:18 38 A5 3B ED 96 35 85 BF
3129:29 8D 93 35 A5 3C E9 00 3B
3131:85 2A 8D 94 35 20 55 20 D0
3139:60 20 CB 1E A9 C6 A0 34 0D
3141:20 18 1E A9 01 8D 15 35 B5
3149:60 A5 D3 C9 05 D0 25 20 32
3151:CB 1E A9 D0 A0 34 20 18 91
3159:1E A9 0E 20 7E 27 8D B5 5A
3161:35 F0 0E A0 00 B9 46 35 0F
3169:99 B6 35 C8 CC 1A 35 D0 83
3171:F4 4C 69 1E 38 A5 29 85 A0
3179:9E ED 93 35 85 3B A5 2A FA
3181:85 9F ED 94 35 05 3B D0 9A
3189:6B A9 FF 8D 94 35 18 AD 3C
3191:96 35 65 29 85 26 A9 00 E3
3199:65 2A 85 27 38 AD 18 35 3A
31A1:E5 9E 85 B4 AD 19 35 E5 BC
31A9:9F 85 B5 20 A0 1C 38 AD 89
31B1:18 35 ED 96 35 8D 18 35 D9
31B9:AD 19 35 E9 00 8D 19 35 1C
31C1:AD B5 35 F0 2F 8D 8F 35 22
31C9:A9 00 8D 90 35 20 14 25 33
31D1:A0 00 A9 29 8D BB 03 B9 67
31D9:B6 35 20 EC 1E 20 B7 03 9B
31E1:C8 CC B5 35 D0 F1 18 A5 0A
31E9:29 6D B5 35 85 29 A5 2A 8C
31F1:69 00 85 2A 4C 55 20 A0 F4
31F9:00 C4 54 F0 20 B1 FD 30 1B
3201:1D 20 F2 2A 20 8F 32 20 C0
3209:15 2B AD 92 35 F0 0A A9 CC
3211:08 20 15 2B A9 5F 20 15 F6
3219:2B C8 4C FA 31 60 8C 8D 30
3221:35 29 7F 8D 8E 35 20 F2 AF
3229:2A C9 43 D0 1A 38 AD 89 21
3231:35 E5 54 4A 38 ED 7E 35 84
3239:A8 A9 20 20 15 2B 88 D0 99
3241:FA AC 8D 35 4C 1A 32 C9 4C
3249:45 D0 10 38 AD 7F 35 E5 C5
3251:54 38 ED 7E 35 A8 A9 20 53
3259:4C 3C 32 C9 55 D0 08 AD 81
3261:92 35 49 01 8D 92 35 C9 80
3269:23 D0 17 8C 8D 35 20 3B FB
3271:2B 90 09 AE 85 35 AD 86 7E
3279:35 20 EC 28 AC 8D 35 4C F2
3281:1A 32 AE 8E 35 BD D4 35 BD
3289:20 15 2B 4C 1A 32 AE 91 F5
3291:35 F0 1A 85 3B 29 7F C9 AF
3299:41 90 12 C9 5B B0 0E AA 06
32A1:A5 3B 29 80 49 80 4A 4A FF
32A9:85 3B 8A 05 3B 60 20 CB A8
32B1:1E 78 20 3D 1D A9 00 8D 38
32B9:00 FF 38 AD 0C 35 ED 18 29
32C1:35 AA AD 0D 35 ED 19 35 BA
32C9:85 64 86 65 A2 90 38 20 19
32D1:75 8C 20 44 8E A0 00 B9 0D
32D9:00 01 F0 06 20 0C 1D C8 31
32E1:D0 F5 A9 0E 8D 00 FF 20 CE
32E9:1C 1D 58 A9 F5 A0 33 20 02
32F1:18 1E A9 01 8D 15 35 60 BA
32F9:53 10 05 05 04 53 03 12 82
3301:09 10 14 20 31 32 38 20 57
3309:20 20 20 00 02 19 20 43 83
3311:08 01 12 0C 05 13 20 42 B5
3319:12 01 0E 0E 0F 0E 20 00 5C
3321:42 15 06 06 05 12 20 03 C2
```

```
3329:0C 05 01 12 05 04 00 42 92
3331:15 06 06 05 12 20 06 15 E6
3339:0C 0C 00 44 45 4C 45 54 27
3341:45 20 28 53 2C 57 2C 50 F3
3349:29 00 3A 20 41 12 05 20 0A
3351:19 0F 15 20 13 15 12 05 C2
3359:3F 20 28 59 2F 4E 29 3A 41
3361:00 45 52 41 53 45 20 41 A8
3369:4C 4C 20 54 45 58 54 00 86
3371:45 52 41 53 45 20 28 53 BA
3379:2C 57 2C 50 29 3A 20 3C 05
3381:52 45 54 55 52 4E 3E 20 AA
3389:14 0F 20 05 18 09 14 00 1F
3391:50 12 05 13 13 20 06 0F AA
3399:12 0D 01 14 20 0B 05 19 FD
33A1:3A 00 53 01 16 05 3A 00 D8
33A9:20 20 20 20 20 20 20 20 10
33B1:20 20 20 53 14 01 14 15 4B
33B9:13 3A 00 56 05 12 09 06 26
33C1:19 20 05 12 12 0F 12 00 6F
33C9:49 0E 10 15 14 20 13 03 F5
33D1:12 05 05 0E 20 0C 09 0E 55
33D9:05 20 0C 05 0E 07 14 08 59
33E1:3A 20 00 00 00 00 4C 0F 15
33E9:01 04 3A 00 56 05 12 09 0D
33F1:06 19 3A 00 20 42 19 14 39
33F9:05 13 20 46 12 05 05 20 DE
3401:20 20 00 44 09 13 0B 20 90
3409:43 0F 0D 0D 01 0E 04 3A CB
3411:00 24 4E 0F 20 12 0F 0F B3
3419:0D 00 4E 0F 20 14 05 18 36
3421:14 20 09 0E 20 02 15 06 D6
3429:06 05 12 2E 00 20 50 12 2E
3431:09 0E 14 20 14 0F 3A 20 97
3439:3C 53 3E 03 12 05 05 0E 49
3441:2C 3C 44 3E 09 13 0B 2C 12
3449:3C 50 3E 12 09 0E 14 05 7A
3451:12 3F 00 44 05 16 09 03 6C
3459:05 20 0E 15 0D 02 05 12 EB
3461:3F 00 53 05 03 0F 0E 04 98
3469:01 12 19 20 01 04 04 12 2E
3471:05 13 13 20 23 3F 00 50 EB
3479:12 09 0E 14 20 14 0F 20 BF
3481:06 09 0C 05 0E 01 0D 05 94
3489:3A 00 20 50 12 09 0E 14 FC
3491:09 0E 07 2E 2E 2E 2E 2E 7A
3499:00 49 0E 13 05 12 14 20 FF
34A1:0E 05 18 14 20 13 08 05 F8
34A9:05 14 2C 20 10 12 05 13 07
34B1:13 20 3C 52 45 54 55 52 D0
34B9:4E 3E 00 48 15 0E 14 20 86
34C1:06 0F 12 3A 00 4E 0F 14 42
34C9:20 06 0F 15 0E 04 00 52 C9
34D1:05 10 0C 01 03 05 20 17 D5
34D9:09 14 08 3A 00 45 58 49 7F
34E1:54 20 53 10 05 05 04 53 7F
34E9:03 12 09 10 14 00 49 0E BB
34F1:13 05 12 14 20 4D 0F 04 01
34F9:05 00 26 20 42 0F 02 20 1E
3501:4B 0F 04 01 04 05 0B 00 AF
3509:2A 00 00 00 00 00 00 00 88
```

Program 2: SpeedScript File-Conversion Utility

```
QE 100 PRINT CHR$(14);"{CLR}
       {RVS}{2 SPACES}SPEEDSCR
       IPT FILE CONVERSION PRO
       GRAM{2 SPACES}"
PE 110 GOSUB 410
AS 120 INPUT"{DOWN}INPUT FILE
       {SPACE}NAME";I$
JB 130 IF I$="" THEN 120
SA 140 INPUT"{DOWN}OUTPUT FILE
        NAME";O$
XC 150 PRINT"{DOWN}{RVS}D{OFF}
       ISK, {RVS}S{OFF}CREEN,
       {SPACE}{RVS}P{OFF}RINTE
       R, {RVS}O{OFF}THER"
JB 160 GETKEY K$
AF 170 DV=-(K$="T")-3*(K$="S")
       -4*(K$="P")-8*(K$="D"):
       SA=7
QB 180 IF DV=0 THEN INPUT"DEVI
       CE NUMBER";DV:INPUT"SEC
       ONDARY ADDRESS";SA
KX 190 PRINT"{2 DOWN}WHICH CON
       VERSION:"
BF 200 PRINT"{DOWN}1) SPEEDSCR
       IPT TO COMMODORE ASCII"
HG 210 PRINT"{DOWN}2) SPEEDSCR
       IPT TO TRUE ASCII"
BG 220 PRINT"{DOWN}3) COMMODOR
       E ASCII TO SPEEDSCRIPT"
DG 230 GETKEY K$:IF K$<"1" OR
       {SPACE}K$>"3" THEN 230
ER 240 ADR=4864+(VAL(K$)-1)*3
EX 250 DCLEAR:REM OMIT THIS LI
       NE IF YOU'VE CHANGED TH
       E DRIVE'S SPEED
AS 260 OPEN 1,8,3,I$:IF DS<>0
       {SPACE}THEN F$=I$:GOTO
       {SPACE}390
FX 270 IF DV<>8 THEN OPEN 2,DV
       ,SA,O$:GOTO 360
FF 280 IF K$="3" THEN EX$=",P,
       W":ELSE K$=",S,W"
HM 290 OPEN 2,8,SA,"0:"+O$+EX$
HX 300 IF DS=0 THEN 360:ELSE F
       $=O$
FH 310 IF DS<>63 THEN 390
QS 320 PRINT"{DOWN}";F$;" EXIS
       TS... REPLACE? ({RVS}Y
       {OFF}/{RVS}N{OFF})"
JE 330 GETKEY K$:IF K$="N" THE
       N 400
MB 340 IF K$<>"Y" THEN 330
CB 350 CLOSE 2:SCRATCH(O$):GOT
       O 290
KR 360 BANK 15:SYS(ADR)
RR 370 IF(PEEK(144)AND191)<>0
       {SPACE}THEN PRINT"
       {DOWN}I/O ERROR DURING
       {SPACE}CONVERSION!":GOT
       O 400
SK 380 PRINT"{DOWN}DONE!":GOTO
        400
GB 390 PRINT"{DOWN}DISK ERROR
       {SPACE}OPENING ";F$:PRI
       NT DS$
HH 400 PRINT"{3 DOWN}RUN{3 UP}
       ":CLOSE 2:CLOSE 1:END
AC 410 BANK 15:FOR I=4864 TO 5
       052:READ A:POKE I,A:CK=
       CK+A:NEXT
DR 420 IF CK=22903 THEN RETURN
SG 430 PRINT"{2 DOWN}{RVS}ERRO
       R IN DATA STATEMENTS!":
       END
MP 440 DATA 76,9,19,76,62,19,7
       6,114,19,32
XX 450 DATA 225,255,240,18,32,
       156,19,32,35,19
JR 460 DATA 32,183,255,72,32,1
       69,19,104,41,64
GA 470 DATA 240,233,76,204,255
       ,133,251,41,64,10
RP 480 DATA 5,251,41,191,133,2
       51,41,32,73,32
JE 490 DATA 10,5,251,201,95,20
       8,2,169,13,133
DC 500 DATA 251,96,32,225,255,
       240,44,32,156,19
RP 510 DATA 32,35,19,41,127,20
       1,65,144,18,201
RE 520 DATA 91,176,14,170,165,
       251,41,128,73,128
PX 530 DATA 74,74,133,251,138,
       5,251,133,251,32
FJ 540 DATA 183,255,72,32,169,
       19,104,41,64,240
AH 550 DATA 207,76,204,255,32,
       225,255,240,34,32
PG 560 DATA 156,19,201,13,208,
       2,169,31,72,41
XJ 570 DATA 128,74,133,251,104
       ,41,63,5,251,133
GC 580 DATA 251,32,183,255,72,
       32,169,19,104,41
ME 590 DATA 64,240,217,76,204,
       255,32,204,255,162
BP 600 DATA 1,32,198,255,176,1
       8,76,207,255,32
HC 610 DATA 204,255,162,2,32,2
       01,255,176,5,165
EC 620 DATA 251,76,210,255,104
       ,104,76,204,255
```

Horizons: Cricket Graphics

See instructions in article on page 76 before typing in.

```
C000:4C 0F C0 4C 43 C0 4C 6B 69
C008:C0 4C 8D C0 4C D9 C0 20 26
C010:9D C1 F0 05 C9 01 F0 16 89
C018:60 AD 00 DD 29 FC 09 03 65
C020:8D 00 DD A9 15 8D 18 D0 9E
C028:A9 1B 8D 11 D0 60 A9 3B 9E
C030:8D 11 D0 A9 38 8D 18 D0 6A
C038:AD 00 DD 29 FC 09 01 8D 7A
C040:00 DD 60 78 A5 01 29 FE 4F
C048:85 01 A2 20 A9 A0 8D 59 67
C050:C0 A9 00 8D 58 C0 A8 99 26
C058:FF FF 88 D0 FA EE 59 C0 FE
C060:CA D0 F4 A5 01 09 01 85 28
C068:01 58 60 20 9D C1 0A 0A A0
C070:0A 0A 85 FB 20 9D C1 29 0E
C078:0F 05 FB A0 FA 99 FF 8B 16
C080:99 F9 8C 99 F3 8D 99 ED 6F
C088:8E 88 D0 F1 60 20 9D C1 2D
C090:8D 11 C2 20 9D C1 8D 12 98
C098:C2 A5 64 8D 13 C2 20 9D CB
C0A0:C1 8D 14 C2 20 A9 C1 78 B8
C0A8:A5 01 29 FE 85 01 A0 00 C3
C0B0:A5 FF AE 11 C2 F0 08 CA A0
C0B8:F0 0D CA F0 10 58 60 49 4A
C0C0:FF 31 FB 91 FB D0 0A 11 6F
C0C8:FB 91 FB D0 04 51 FB 91 28
C0D0:FB A5 01 09 01 85 01 58 E2
C0D8:60 20 9D C1 85 F9 20 9D 54
C0E0:C1 8D 12 C2 A5 64 8D 13 02
C0E8:C2 20 9D C1 8D 14 C2 20 06
C0F0:A9 C1 A9 00 A2 07 9D 15 6E
C0F8:C2 9D 25 C2 DE 25 C2 9D C2
C100:2D C2 CA 10 F1 AD 10 C2 4E
C108:6A 6A A9 0D 2A 85 FA 06 C4
C110:F9 26 FA 06 F9 26 FA 06 3E
C118:F9 26 FA 78 A5 01 48 29 F3
C120:FA 85 01 A0 07 B1 F9 99 39
C128:1D C2 88 10 F8 A5 FB 18 6B
C130:69 08 85 FD A9 00 65 FC 10
C138:85 FE A2 07 1E 1D C2 3E 2C
C140:15 C2 1E 25 C2 3E 2D C2 41
C148:CA 10 F1 66 FF 90 EB A0 94
C150:00 A2 00 BD 25 C2 31 FB EA
C158:1D 15 C2 91 FB BD 2D C2 15
C160:31 FD 1D 1D C2 91 FD E6 B0
C168:FB D0 02 E6 FC E6 FD D0 1D
C170:02 E6 FE A5 FD 29 07 D0 5C
C178:1A A9 38 18 65 FB 85 FB 1E
C180:A9 01 65 FC 85 FC A9 38 41
C188:18 65 FD 85 FD A9 01 65 87
C190:FE 85 FE E8 E0 08 D0 BB E7
C198:68 85 01 58 60 20 FD AE 85
C1A0:20 9E AD 20 9B BC A5 65 14
C1A8:60 AD 02 DD 09 03 8D 02 57
C1B0:DD AD 00 DD 29 03 49 03 57
C1B8:4A 6A 6A 85 FC AD 18 D0 41
C1C0:8D 10 C2 29 08 0A 0A 05 7B
C1C8:FC 85 FC AD 14 C2 48 29 0C
C1D0:07 85 FB 68 4A 4A 4A A8 F7
C1D8:F0 10 A9 40 18 65 FB 85 E5
C1E0:FB A9 01 65 FC 85 FC 88 C3
C1E8:D0 F0 6E 13 C2 90 02 E6 53
C1F0:FC AD 12 C2 48 29 F8 18 BD
C1F8:65 FB 85 FB 90 02 E6 FC F5
C200:A9 80 85 FF 68 29 07 AA CB
C208:F0 05 46 FF CA D0 FB 60 02
```

• A few bugs escaped us in "80-Column Disk Sector Editor" (August). When you change disks with the exchange-disk (E) command, a sector is read in from the new disk from the same track and sector as the previous disk. The information on the screen will be that of the current disk, but the value in the *Byte:* box at the lower left of the screen will be left over from the previous disk. This problem can be corrected by renumbering line 2250 to line 2225. Be sure to delete the original line 2250 after renumbering.

Another problem with the exchange-disk command involves going from a double-sided disk to a single-sided disk. If you are examining a sector from the second side of a double-sided disk (tracks 36–70) and you type E to change to a single-sided disk, the disk drive will return an ILLEGAL TRACK OR SECTOR error. Add the following line to fix this bug.

```
RJ 4685 IF NS=1 AND TR>35 THEN TR=18:SE=Ø
```

The following changes are enhancements, not corrections. Modifying the directory track (18) of a disk can cause the Block Availability Map to become outdated. This can be prevented by validating the disk before exiting to BASIC. If you do not want to make this modification (perhaps you use 80-Column Disk Sector Editor with *GEOS* disks), do not make the changes to lines 460 and 510 shown below.

Many sector editors for the 64 and 128 allow you to place the cursor on a pointer (like the pointers to the start of a file in directory entries) and press a key to follow the pointer. This feature is easily added to 80-Column Disk Sector Editor while adding only a few extra lines to the program. To use the new jump command, position the cursor over the pointer you want to follow and press the J key (think of Jump).

Another feature common to most disk sector editors is the ability to print a hardcopy of the contents of a disk sector. Again, this feature is easy to add. To use the print command, simply display the desired sector on the screen, be sure your printer is turned on, and press the P key. Print works with Commodore compatible printers and should work with most suitably interfaced non-Commodore printers.

As you will note, these enhancements are not only very useful, but also very small. To make these modifications, first change the following lines:

```
JQ 130 DIM KP(20)
FP 140 FORA=1TO20:READ KP(A):NEXTA
JA 430 LOOPUNTILL=21
BF 440 ONLGOSUB630,630,760,760,890,1050,1110,
       1260,4050,570,1700,1810,1390,1540,2300
       ,2180,2610,480,5000,6000
RF 460 OPEN1,8,15,"V0":CLOSE1:PRINT"BASIC V7.
       Ø":END
RJ 510 PRINTRD$;"VALIDATING. PLEASE WAIT...
       {3 DOWN}"
PH 3520 PRINTRD$;"S: SEND COMMAND{2 SPACES}F:
        FORMAT DISK{4 SPACES}N: NEXT MENU
        {3 SPACES}P: PRINT{8 SPACES}Q: QUIT P
        ROG."
GK 3530 PRINT"C: CATALOG DISK{2 SPACES}E: EXC
        HANGE DISK{2 SPACES}M: MOVE BLOCK
        {2 SPACES}J: JUMP TO PTR";
BQ 4840 DATA 40,73,43,74,28,42,46,22,9,39,13,
        20,8,18,21,14,36,62,34,41
```

Then add these:

```
AA 5000 T1=TR:S1=SE
MP 5010 IF X<15 OR Y<15 THEN BEGIN:TR=PEEK(71
        68+X+16*Y):SE=PEEK(7169+X+16*Y)
RM 5020 IF TR<1 OR TR>FNT(NS) OR SE<Ø OR SE>F
        NSC(TR) THEN PRINTCHR$(7):TR=T1:SE=S
        1:RETURN
FP 5030 GOSUB 580:GOSUB2990:BEND:ELSE PRINTCH
        R$(7);
JK 5040 RETURN
GG 6000 WINDOW Ø,Ø,79,24:OPEN4,4,7:OPEN3,3
EC 6010 PRINT#4,CHR$(13):PRINT"{HOME}";:FORI=
        ØTO22:CHAR,Ø,I:FORJ=ØTO78:GET#3,A$:IF
        A$>CHR$(31)ANDA$<CHR$(127)ORA$>CHR$(1
        59)THENPRINT#4,A$;:ELSEPRINT#4," ";
DH 6020 NEXT:PRINT#4,CHR$(13);:GET#3,A$:NEXT:
        PRINT#4,:PRINTCHR$(27)"O";:CLOSE4:CLO
        SE3
PQ 6030 WINDOW Ø,18,79,22:GOSUB 4200:GOSUB430
        Ø:RETURN
```

Many thanks to Charles Kluepfel for providing these corrections and enhancements.

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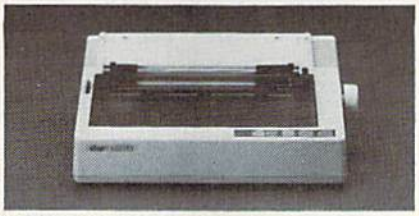

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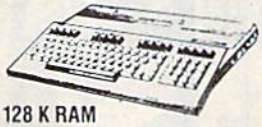

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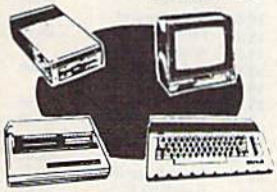

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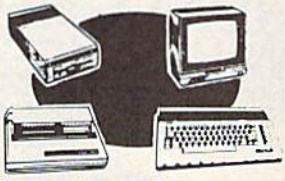

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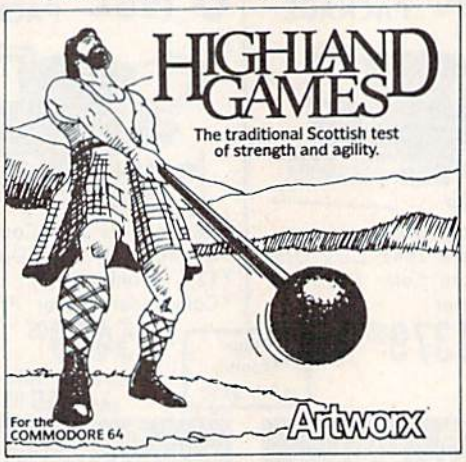

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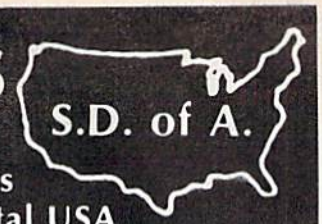

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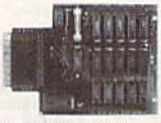

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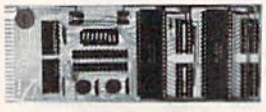

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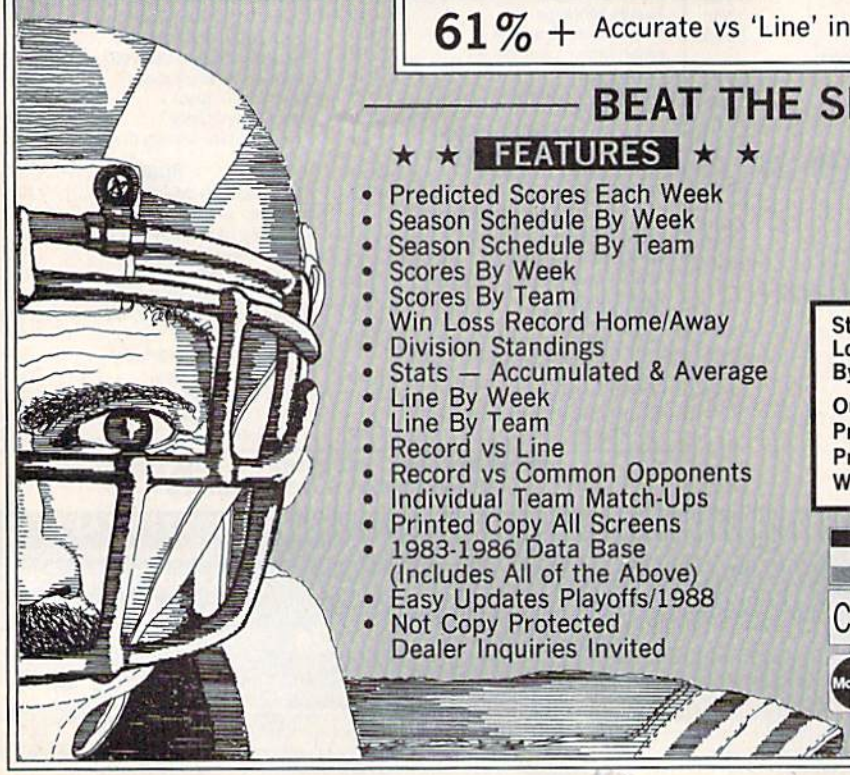

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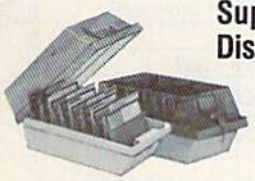

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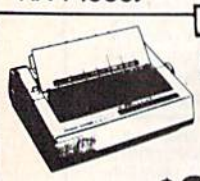

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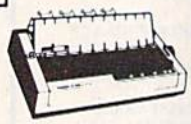

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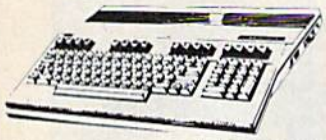

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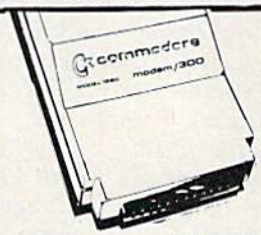

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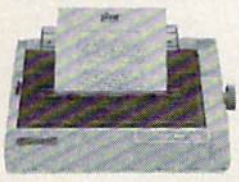

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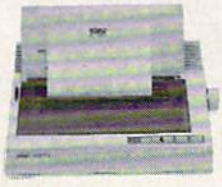

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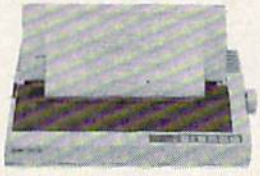

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How To Type In *COMPUTE!'s GAZETTE* Programs

Each month, COMPUTE!'s GAZETTE publishes programs for the Commodore 128, 64, Plus/4, and 16. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We frequently publish two programs designed to make typing easier: The Automatic Proofreader, and MLX, designed for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off then on, erasing what was in memory. So be sure to *save a program before you run it.* If your computer crashes, you can always reload the program and look for the error.

Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from the GAZETTE, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor down key; {5 SPACES} means to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing another key), the character is underlined. For example, A means hold down the SHIFT key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 A}), type the key as many times as indicated (in our example, enter eight SHIFTed A's).

If a key is enclosed in special brackets, [ ], hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces. This can be entered on the Commodore 64 by pressing the CTRL key while typing the letter in braces. For example, {A} means to press CTRL-A.

The Quote Mode

Although you can move the cursor around the screen with the CRSR keys, often a programmer will want to move the cursor under program control. This is seen in examples such as {LEFT}, and {HOME} in the program listings. The only way the computer can tell the difference between direct and programmed cursor control is *the quote mode.*

Once you press the quote key, you're in quote mode. This mode can be confusing if you mistype a character and cursor left to change it. You'll see a reverse video character (a graphics symbol for cursor left). In this case, you can use the DELete key to back up and edit the line. Type another quote and you're out of quote mode. If things really get confusing, you can exit quote mode simply by pressing RETURN. Then just cursor up to the mistyped line and fix it.

When You Read:	Press:	See:
{CLR}	SHIFT + CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT + ↑ CRSR ↓	
{DOWN}	↑ CRSR ↓	
{LEFT}	SHIFT + ←CRSR→	
{RIGHT}	←CRSR→	
{RVS}	CTRL + 9	
{OFF}	CTRL + 0	
{BLK}	CTRL + 1	
{WHT}	CTRL + 2	
{RED}	CTRL + 3	
{CYN}	CTRL + 4	

When You Read:	Press:	See:
{PUR}	CTRL + 5	
{GRN}	CTRL + 6	
{BLU}	CTRL + 7	
{YEL}	CTRL + 8	
{ F1 }	f1	
{ F2 }	SHIFT + f1	
{ F3 }	f3	
{ F4 }	SHIFT + f3	
{ F5 }	f5	
{ F6 }	SHIFT + f5	
{ F7 }	f7	
{ F8 }	SHIFT + f7	

When You Read:	Press:	See:
←	←	
↑	SHIFT + ↑	

For Commodore 64 Only

When You Read:	Press:	See:
[1]	COMMODORE + 1	
[2]	COMMODORE + 2	
[3]	COMMODORE + 3	
[4]	COMMODORE + 4	
[5]	COMMODORE + 5	
[6]	COMMODORE + 6	
[7]	COMMODORE + 7	
[8]	COMMODORE + 8	

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Now that you're able to do all those stand alone applications with your Commodore, like word processing, spread sheet analysis, etc., you are probably thinking "It would sure be nice if I could expand the information I have access to." Everything from Electronic Mail (E-mail) to stock quotes and huge databases of every imaginable type is now on-line just waiting for you to dial up. All you need is a telephone line and a modem connected to your Commodore which allows you to download this information.

Which modem is best for you?" Lets first say that almost all modems (and services) are set up to communicate in one of two speeds; 300 and 1200 Baud. If you look around you will find that there is a flood of 300 baud modems on the market and sometimes at very low prices. The reason is simple, they are being dumped because most computer users prefer 1200 Baud. (1200 Baud is about 4 times as fast which means you spend less time and money getting the data you want and more time using it.) Virtually everyone who has a 300 would rather have a 1200. You will also notice a few very cheap 1200s on the market at "too good to be true prices". They are. Most are cheaply built foreign copies of American designs. The service and support you receive is minimal-to-nonexistent for these models.

Recently we re-evaluated our modem line and discovered that the best price/performance tradeoff for our Commodore customers would be a straightforward, easy-to-use unit with no complicated switch settings or indicators, but one that just did what our customers wanted without complications. To our surprise (and contrary to popular belief), we found that we could build the unit in the USA with better reliability and performance levels than anywhere else. We found that because of a significant increase in reliability that American components and manufacturing give us, we now have the best fail-safe product possible. An unreliable product is not worth the price, however low. Get a modem that will satisfy your present AND future needs by going directly to the American built **Aprotek 12C!**

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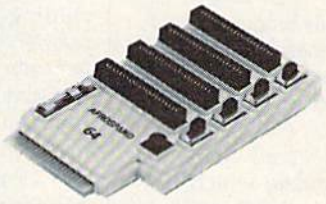

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The Automatic Proofreader

Philip I. Nelson

"The Automatic Proofreader" helps you type in program listings for the 128, 64, Plus/4, and 16 and prevents nearly every kind of typing mistake.

Type in the Proofreader *exactly* as listed. Since the program can't check itself, type carefully to avoid mistakes. Don't omit any lines, even if they contain unfamiliar commands. After finishing, save a copy or two on disk or tape before running it. This is important because the Proofreader erases the BASIC portion of itself when you run it, leaving only the machine language portion in memory.

Next, type RUN and press RETURN. After announcing which computer it's running on, the Proofreader displays the message "Proofreader Active". Now you're ready to type in a BASIC program.

Every time you finish typing a line and press RETURN, the Proofreader displays a two-letter checksum in the upper-left corner of the screen. Compare this result with the two-letter checksum printed to the left of the line in the program listing. If the letters match, it's almost certain the line was typed correctly. If the letters don't match, check for your mistake and correct the line.

The Proofreader ignores spaces not enclosed in quotes, so you can omit or add spaces between keywords and still see a matching checksum. However, since spaces inside quotes are almost always significant, the Proofreader pays attention to them. For example, **10 PRINT"THIS IS BASIC"** will generate a different checksum than **10 PRINT"THIS ISBA SIC"**.

A common typing error is transposition—typing two successive characters in the wrong order, like PIRNT instead of PRINT or 64378 instead of 64738. The Proofreader is sensitive to the *position* of each character within the line and thus catches transposition errors.

The Proofreader does *not* accept keyword abbreviations (for example, ? instead of PRINT). If you prefer to use abbreviations, you can still check the line by LISTing it after typing it in, moving the cursor back to the line, and pressing RETURN. LISTing the line substitutes the full keyword for the abbreviation and allows the Proofreader to work properly. The same technique works for rechecking programs you've already typed in.

If you're using the Proofreader on the Commodore 128, Plus/4, or 16, *do not perform any GRAPHIC commands while the Proofreader is active.* When you perform a command like GRAPHIC 1, the computer moves everything at the start of BASIC program space—including the Proofreader—to another memory area, causing the Proofreader to crash. The same thing happens if you *run* any program with a GRAPHIC command while the Proofreader is in memory.

Though the Proofreader doesn't interfere with other BASIC operations, it's a good idea to disable it before running another program. However, the Proofreader is purposely difficult to dislodge: It's not affected by tape or disk operations, or by pressing RUN/STOP–RESTORE. The simplest way to disable it is to turn the computer off then on. A gentler method is to SYS to the computer's built-in reset routine (SYS 65341 for the 128, 64738 for the 64, and 65526 for the Plus/4 and 16). These reset routines erase any program in memory, so be sure to save the program you're typing in before entering the SYS command.

If you own a Commodore 64, you may already have wondered whether the Proofreader works with other programming utilities like "MetaBASIC." The answer is generally yes, *if you're using a 64 and activate the Proofreader after installing the other utility.* For example, first load and activate MetaBASIC, then load and run the Proofreader.

When using the Proofreader with another utility, you should disable *both* programs before running a BASIC program. While the Proofreader seems unaffected by most utilities, there's no way to promise that it will work with any and every combination of utilities you might want to use. The more utilities activated, the more fragile the system becomes.

The New Automatic Proofreader

```
10 VEC=PEEK(772)+256*PEEK(773)
   :LO=43:HI=44
20 PRINT "AUTOMATIC PROOFREADE
   R FOR ";:IF VEC=42364 THEN
   {SPACE}PRINT "C-64"
30 IF VEC=50556 THEN PRINT "VI
   C-20"
40 IF VEC=35158 THEN GRAPHIC C
   LR:PRINT "PLUS/4 & 16"
50 IF VEC=17165 THEN LO=45:HI=
   46:GRAPHIC CLR:PRINT"128"
60 SA=(PEEK(LO)+256*PEEK(HI))+
   6:ADR=SA
70 FOR J=0 TO 166:READ BYT:POK
   E ADR,BYT:ADR=ADR+1:CHK=CHK
   +BYT:NEXT
80 IF CHK<>20570 THEN PRINT "*
   ERROR* CHECK TYPING IN DATA
    STATEMENTS":END
90 FOR J=1 TO 5:READ RF,LF,HF:
   RS=SA+RF:HB=INT(RS/256):LB=
   RS-(256*HB)
100 CHK=CHK+RF+LF+HF:POKE SA+L
   F,LB:POKE SA+HF,HB:NEXT
110 IF CHK<>22054 THEN PRINT "
   *ERROR* RELOAD PROGRAM AND
   {SPACE}CHECK FINAL LINE":EN
   D
120 POKE SA+149,PEEK(772):POKE
    SA+150,PEEK(773)
130 IF VEC=17165 THEN POKE SA+
   14,22:POKE SA+18,23:POKESA+
   29,224:POKESA+139,224
140 PRINT CHR$(147);CHR$(17);"
   PROOFREADER ACTIVE":SYS SA
150 POKE HI,PEEK(HI)+1:POKE (P
   EEK(LO)+256*PEEK(HI))-1,0:N
   EW
160 DATA 120,169,73,141,4,3,16
   9,3,141,5,3
170 DATA 88,96,165,20,133,167,
   165,21,133,168,169
180 DATA 0,141,0,255,162,31,18
   1,199,157,227,3
190 DATA 202,16,248,169,19,32,
   210,255,169,18,32
200 DATA 210,255,160,0,132,180
   ,132,176,136,230,180
210 DATA 200,185,0,2,240,46,20
   1,34,208,8,72
220 DATA 165,176,73,255,133,17
   6,104,72,201,32,208
230 DATA 7,165,176,208,3,104,2
   08,226,104,166,180
240 DATA 24,165,167,121,0,2,13
   3,167,165,168,105
250 DATA 0,133,168,202,208,239
   ,240,202,165,167,69
260 DATA 168,72,41,15,168,185,
   211,3,32,210,255
270 DATA 104,74,74,74,74,168,1
   85,211,3,32,210
280 DATA 255,162,31,189,227,3,
   149,199,202,16,248
290 DATA 169,146,32,210,255,76
   ,86,137,65,66,67
300 DATA 68,69,70,71,72,74,75,
   77,80,81,82,83,88
310 DATA 13,2,7,167,31,32,151,
   116,117,151,128,129,167,136
   ,137
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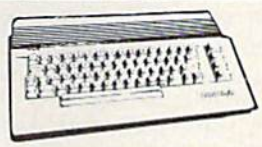

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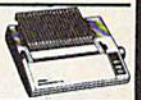

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MLX Machine Language Entry Program For Commodore 64 and 128

Ottis R. Cowper, Technical Editor

"MLX" is a labor-saving utility that allows almost fail-safe entry of machine language programs. Included are versions for the Commodore 64 and 128.

Type in and save some copies of whichever version of MLX is appropriate for your computer (you'll want to use it to enter future ML programs from COMPUTE!'s GAZETTE). Program 1 is for the Commodore 64, and Program 2 is for the 128 (128 MLX can also be used to enter Commodore 64 ML programs for use in 64 mode). When you're ready to enter an ML program, load and run MLX. It asks you for a starting address and an ending address. These addresses appear in the article accompanying the MLX-format program listing you're typing.

If you're unfamiliar with machine language, the addresses (and all other values you enter in MLX) may appear strange. Instead of the usual decimal numbers you're accustomed to, these numbers are in *hexadecimal*—a base 16 numbering system commonly used by ML programmers. Hexadecimal—hex for short—includes the numerals 0–9 and the letters A–F. But don't worry—even if you know nothing about ML or hex, you should have no trouble using MLX.

After you enter the starting and ending addresses, you'll be offered the option of clearing the workspace. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session, don't choose this option.

A functions menu will appear. The first option in the menu is ENTER DATA. If you're just starting to type in a program, pick this. Press the E key, and type the first number in the first line of the program listing. If you've already typed in part of a program, type the line number where you left off typing at the end of the previous session (be sure to load the partially completed program before you resume entry). In any case, make sure the address you enter corresponds to the address of a line in the listing you are entering. Otherwise, you'll be unable to enter the data correctly. If you pressed E by mistake, you can return to the command menu by pressing RETURN alone when asked for the address. (You can get back to the menu from most options by pressing RETURN with no other input.)

Entering A Listing

Once you're in Enter mode, MLX prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight data bytes and a checksum. Although an MLX-format listing appears similar to the "hex dump" listings from a machine language monitor program, the extra checksum number on the end allows MLX to check your typing. (Commodore 128 users *can* enter the data from an MLX listing using the built-in monitor if the rightmost column of data is omitted, but we recommend against it. It's much easier to let MLX do the proofreading and error checking for you.)

When you enter a line, MLX recalculates the checksum from the eight bytes and the address and compares this value to the number from the ninth column. If the values match, you'll hear a bell tone, the data will be added to the workspace area, and the prompt for the next line of data will appear. But if MLX detects a typing error, you'll hear a low buzz and see an error message. The line will then be redisplayed for editing.

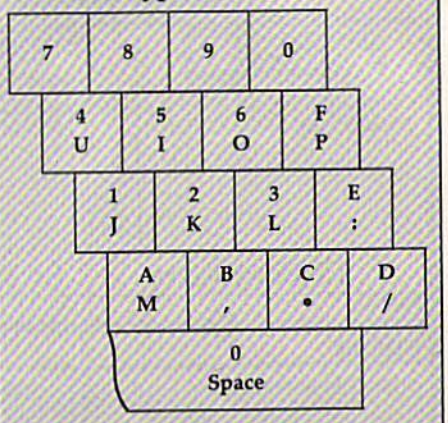
Invalid Characters Banned

Only a few keys are active while you're entering data, so you may have to unlearn some habits. You *do not* type spaces between the columns; MLX automatically inserts these for you. You *do not* press RETURN after typing the last number in a line; MLX automatically enters and checks the line after you type the last digit.

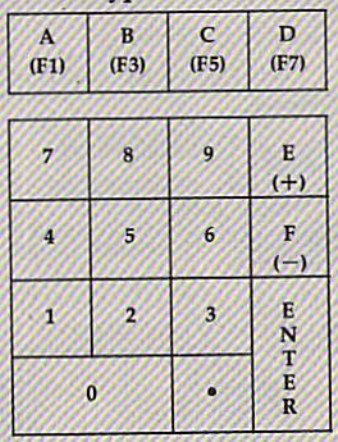
Only the numerals 0–9 and the letters A–F can be typed in. If you press any other key (with some exceptions noted below), you'll hear a warning buzz. To simplify typing, 128 MLX redefines the function keys and + and − keys on the numeric keypad so that you can enter data one-handed. (The 64 version incorporates the keypad modification from the March 1986 "Bug-Swatter" column, lines 485–487.) In either case, the keypad is active only while entering data. Addresses must be entered with the normal letter and number keys. The figures above show the keypad configurations for each version.

MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, MLX will catch your mistake. There is one error that can slip past MLX: Because of the checksum formula used, MLX won't notice if you accidentally type FF in place of 00, and vice versa. And there's a very slim chance that you could garble a line and still end up with a combination of characters that adds up to the proper checksum. However, these mistakes should not occur if you take reasonable care while entering data.

64 MLX Keypad



128 MLX Keypad



Editing Features

To correct typing mistakes before finishing a line, use the INST/DEL key to delete the character to the left of the cursor. (The cursor-left key also deletes.) If you mess up a line really badly, press CLR/HOME to start the line over. The RETURN key is also active, but only before any data is typed on a line. Pressing RETURN at this point returns you to the command menu. After you type a character of data, MLX disables RETURN until the cursor returns to the start of a line. Remember, you can press CLR/HOME to quickly get to a line

number prompt.

More editing features are available when correcting lines in which MLX has detected an error. To make corrections in a line that MLX has redisplayed for editing, compare the line on the screen with the one printed in the listing, then move the cursor to the mistake and type the correct key. The cursor left and right keys provide the normal cursor controls. (The INST/DEL key now works as an alternative cursor-left key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. During editing, RETURN is active; pressing it tells MLX to recheck the line. You can press the CLR/HOME key to clear the entire line if you want to start from scratch, or if you want to get to a line number prompt to use RETURN to get back to the menu.

Display Data

The second menu choice, DISPLAY DATA, examines memory and shows the contents in the same format as the program listing (including the checksum). When you press D, MLX asks you for a starting address. Be sure that the starting address you give corresponds to a line number in the listing. Otherwise, the checksum display will be meaningless. MLX displays program lines until it reaches the end of the program, at which point the menu is redisplayed. You can pause the display by pressing the space bar. (MLX finishes printing the current line before halting.) Press space again to restart the display. To break out of the display and get back to the menu before the ending address is reached, press RETURN.

Other Menu Options

Two more menu selections let you save programs and load them back into the computer. These are SAVE FILE and LOAD FILE; their operation is quite straightforward. When you press S or L, MLX asks you for the filename. You'll then be asked to press either D or T to select disk or tape.

You'll notice the disk drive starting and stopping several times during a load or save (save only for the 128 version). Don't panic; this is normal behavior. MLX opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands (128 MLX makes use of BLOAD). Disk users should also note that the drive prefix 0: is automatically added to the filename (line 750 in 64 MLX), so this should *not* be included when entering the name. This also precludes the use of @ for Save-with-Replace, so remember to give each version you save a different name. The 128 version makes up for this by giving you the option of scratching the existing file if you want to reuse a filename.

Remember that MLX saves the entire workspace area from the starting address to the ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When saving a partially completed listing, make sure to note the address where you stopped typing so you'll know where to resume entry when you reload.

MLX reports the standard disk or tape error messages if any problems are detected during the save or load. (Tape users should bear in mind that Commodore computers are never able to detect errors during a save to tape.) MLX also has three special load error messages: INCORRECT STARTING ADDRESS, which means the file you're trying to load does not have the starting address you specified when you ran MLX; LOAD ENDED AT *address*, which means the file you're trying to load ends before the ending address you specified when you started MLX; and TRUNCATED AT ENDING ADDRESS, which means the file you're trying to load extends beyond the ending address you specified when you started MLX. If you see one of these messages and feel certain that you've loaded the right file, exit and rerun MLX, being careful to enter the correct starting and ending addresses.

The 128 version also has a CATALOG DISK option so you can view the contents of the disk directory before saving or loading.

The QUIT menu option has the obvious effect—it stops MLX and enters BASIC. The RUN/STOP key is disabled, so the Q option lets you exit the program without turning off the computer. (Of course, RUN/STOP-RESTORE also gets you out.) You'll be asked for verification; press Y to exit to BASIC, or any other key to return to the menu. After quitting, you can type RUN again and reenter MLX without losing your data, as long as you don't use the clear workspace option.

The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready to see the results. The instructions for loading and using the finished product vary from program to program. Some ML programs are designed to be loaded and run like BASIC programs, so all you need to type is LOAD *"filename"*,8 for disk (DLOAD *"filename"* on the 128) or LOAD *"filename"* for tape, and then RUN. Such programs will usually have a starting address of 0801 for the 64 or 1C01 for the 128. Other programs must be reloaded to specific addresses with a command such as LOAD *"filename"*,8,1 for disk (BLOAD *"filename"* on the 128) or LOAD *"filename"*,1,1 for tape, then started with a SYS to a particular memory address. On the Commodore 64, the most common starting address for such programs is 49152, which corresponds to MLX address C000. In either case, you should always refer to the article which accompanies the ML listing for information on loading and running the program.

An Ounce Of Prevention

By the time you finish typing in the data for a long ML program, you may have several hours invested in the project. Don't take chances—use our "Automatic Proofreader" to type the new MLX, and then test your copy *thoroughly* before first using it to enter any significant amount of data. Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses, then use the Display option to verify that the data has been entered correctly. And be sure to test the Save and Load options several times to ensure that you can recall your work from disk or tape. Don't let a simple typing error in the new MLX cost you several nights of hard work.

Program 1: MLX For Commodore 64

```
SS 10 REM VERSION 1.1: LINES 8
      30,950 MODIFIED, LINES 4
      85-487 ADDED
EK 100 POKE 56,50:CLR:DIM IN$,
      I,J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z
      4=254:Z5=255:Z6=256:Z7=
      127
CJ 120 FA=PEEK(45)+Z6*PEEK(46)
      :BS=PEEK(55)+Z6*PEEK(56
      ):H$="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$="{LEFT}"
      :S$=" ":D$=CHR$(20):Z$=
      CHR$(0):T$="{13 RIGHT}"
CQ 140 SD=54272:FOR I=SD TO SD
      +23:POKE I,0:NEXT:POKE
      {SPACE}SD+24,15:POKE 78
      8,52
FC 150 PRINT"{CLR}"CHR$(142)CH
      R$(8):POKE 53280,15:POK
      E 53281,15
EJ 160 PRINT T$" {RED}{RVS}
      {2 SPACES}{8 @}
      {2 SPACES}"SPC(28)"
      {2 SPACES}{OFF}{BLU} MI
      X II {RED}{RVS}
      {2 SPACES}"SPC(28)"
      {12 SPACES}{BLU}"
FR 170 PRINT"{3 DOWN}
      {3 SPACES}COMPUTE!'S MA
      CHINE LANGUAGE EDITOR
      {3 DOWN}"
JB 180 PRINT"{BLK}STARTING ADD
```

```
      RESS[4];:GOSUB300:SA=AD:GOSUB1040:IF F THEN180
GF 190 PRINT"{BLK}{2 SPACES}ENDING ADDRESS[4];:GOSUB300:EA=AD:GOSUB1030:IF {SPACE}F THEN190
KR 200 INPUT"{3 DOWN}{BLK}CLEAR WORKSPACE [Y/N][4];A$:IF LEFT$(A$,1)<>"Y"THEN220
PG 210 PRINT"{2 DOWN}{BLU}WORKING...";:FORI=BS TO BS+EA-SA+7:POKE I,0:NEXT:PRINT"DONE"
DR 220 PRINTTAB(10)"{2 DOWN}{BLK}{RVS} MLX COMMAND {SPACE}MENU {DOWN}[4]":PRINT T$"{RVS}E{OFF}NTER DATA"
BD 230 PRINT T$"{RVS}D{OFF}ISPLAY DATA":PRINT T$"{RVS}L{OFF}OAD FILE"
JS 240 PRINT T$"{RVS}S{OFF}AVE FILE":PRINT T$"{RVS}Q{OFF}UIT{2 DOWN}{BLK}"
JH 250 GET A$:IF A$=N$ THEN250
HK 260 A=0:FOR I=1 TO 5:IF A$=MID$("EDLSQ",I,1)THEN A=I:I=5
FD 270 NEXT:ON A GOTO420,610,690,700,280:GOSUB1060:GOTO250
EJ 280 PRINT"{RVS} QUIT ":INPUT"{DOWN}[4]ARE YOU SURE [Y/N]";A$:IF LEFT$(A$,1)<>"Y"THEN220
EM 290 POKE SD+24,0:END
JX 300 IN$=N$:AD=0:INPUTIN$:IF LEN(IN$)<>4THENRETURN
KF 310 B$=IN$:GOSUB320:AD=A:B$=MID$(IN$,3):GOSUB320:AD=AD*256+A:RETURN
PP 320 A=0:FOR J=1 TO 2:A$=MID$(B$,J,1):B=ASC(A$)-C4+(A$>"@")*C7:A=A*C6+B
JA 330 IF B<0 OR B>15 THEN AD=0:A=-1:J=2
GX 340 NEXT:RETURN
CH 350 B=INT(A/C6):PRINT MID$(H$,B+1,1);:B=A-B*C6:PRINT MID$(H$,B+1,1);:RETURN
RR 360 A=INT(AD/Z6):GOSUB350:A=AD-A*Z6:GOSUB350:PRINT":";
BE 370 CK=INT(AD/Z6):CK=AD-Z4*CK+Z5*(CK>Z7):GOTO390
PX 380 CK=CK*Z2+Z5*(CK>Z7)+A
JC 390 CK=CK+Z5*(CK>Z5):RETURN
QS 400 PRINT"{DOWN}STARTING AT [4]";:GOSUB300:IF IN$<>N$ THEN GOSUB1030:IF F {SPACE}THEN400
EX 410 RETURN
HD 420 PRINT"{RVS} ENTER DATA {SPACE}":GOSUB400:IF IN$=N$ THEN220
JK 430 OPEN3,3:PRINT
SK 440 POKE198,0:GOSUB360:IF F THEN PRINT IN$:PRINT"{UP}{5 RIGHT}";
GC 450 FOR I=0 TO 24 STEP 3:B$=S$:FOR J=1 TO 2:IF F THEN B$=MID$(IN$,I+J,1)
HA 460 PRINT"{RVS}"B$L$;:IF I<24THEN PRINT"{OFF}";
HD 470 GET A$:IF A$=N$ THEN470
FK 480 IF(A$>"/"ANDA$<":")OR(A$>"@"ANDA$<"G")THEN540
GS 485 A=-(A$="M")-2*(A$=",")-3*(A$=".")-4*(A$="/")-5*(A$="J")-6*(A$="K")
FX 486 A=A-7*(A$="L")-8*(A$=":")-9*(A$="U")-10*(A$="I")-11*(A$="O")-12*(A$="P")
CM 487 A=A-13*(A$=S$):IF A THEN A$=MID$("ABCD123E456F0",A,1):GOTO 540
MP 490 IF A$=R$ AND((I=0)AND(J=1)OR F)THEN PRINT B$;:J=2:NEXT:I=24:GOTO550
KC 500 IF A$="{HOME}" THEN PRINT B$:J=2:NEXT:I=24:NEXT:F=0:GOTO440
MX 510 IF(A$="{RIGHT}")ANDF THENPRINT B$L$;:GOTO540
GK 520 IF A$<>L$ AND A$<>D$ OR((I=0)AND(J=1))THEN GOSUB1060:GOTO470
HG 530 A$=L$+S$+L$:PRINT B$L$;:J=2-J:IF J THEN PRINT {SPACE}L$;:I=I-3
QS 540 PRINT A$;:NEXT J:PRINT {SPACE}S$;
PM 550 NEXT I:PRINT:PRINT"{UP}{5 RIGHT}";:INPUT#3,IN$:IF IN$=N$ THEN CLOSE3:GOTO220
QC 560 FOR I=1 TO 25 STEP3:B$=MID$(IN$,I):GOSUB320:IF I<25 THEN GOSUB380:A(I/3)=A
PK 570 NEXT:IF A<>CK THEN GOSUB1060:PRINT"{BLK}{RVS}{SPACE}ERROR: REENTER LINE [4]":F=1:GOTO440
HJ 580 GOSUB1080:B=BS+AD-SA:FOR I=0 TO 7:POKE B+I,A(I):NEXT
QQ 590 AD=AD+8:IF AD>EA THEN CLOSE3:PRINT"{DOWN}{BLU}** END OF ENTRY **{BLK}{2 DOWN}":GOTO700
GQ 600 F=0:GOTO440
QA 610 PRINT"{CLR}{DOWN}{RVS}{SPACE}DISPLAY DATA ":GOSUB400:IF IN$=N$ THEN220
RJ 620 PRINT"{DOWN}{BLU}PRESS: {RVS}SPACE{OFF} TO PAUSE, {RVS}RETURN{OFF} TO BREAK[4]{DOWN}"
KS 630 GOSUB360:B=BS+AD-SA:FOR I=BTO B+7:A=PEEK(I):GOSUB350:GOSUB380:PRINT S$;
CC 640 NEXT:PRINT"{RVS}";:A=CK:GOSUB350:PRINT
KH 650 F=1:AD=AD+8:IF AD>EA THENPRINT"{DOWN}{BLU}** END OF DATA **":GOTO220
KC 660 GET A$:IF A$=R$ THEN GOSUB1080:GOTO220
EQ 670 IF A$=S$ THEN F=F+1:GOSUB1080
AD 680 ONFGOTO630,660,630
CM 690 PRINT"{DOWN}{RVS} LOAD {SPACE}DATA ":OP=1:GOTO710
PC 700 PRINT"{DOWN}{RVS} SAVE {SPACE}FILE ":OP=0
RX 710 IN$=N$:INPUT"{DOWN}FILENAME[4]";IN$:IF IN$=N$ {SPACE}THEN220
PR 720 F=0:PRINT"{DOWN}{BLK}{RVS}T{OFF}APE OR {RVS}D{OFF}ISK: [4]";
FP 730 GET A$:IF A$="T"THEN PRINT"T{DOWN}":GOTO880
HQ 740 IF A$<>"D"THEN730
HH 750 PRINT"D{DOWN}":OPEN15,8,15,"I0:":B=EA-SA:IN$="0:"+IN$:IF OP THEN810
SQ 760 OPEN 1,8,8,IN$+",P,W":GOSUB860:IF A THEN220
FJ 770 AH=INT(SA/256):AL=SA-(AH*256):PRINT#1,CHR$(AL);CHR$(AH);
PE 780 FOR I=0 TO B:PRINT#1,CHR$(PEEK(BS+I));:IF ST THEN800
FC 790 NEXT:CLOSE1:CLOSE15:GOTO940
GS 800 GOSUB1060:PRINT"{DOWN}{BLK}ERROR DURING SAVE:[4]":GOSUB860:GOTO220
MA 810 OPEN 1,8,8,IN$+",P,R":GOSUB860:IF A THEN220
GE 820 GET#1,A$,B$:AD=ASC(A$+Z$)+256*ASC(B$+Z$):IF AD<>SA THEN F=1:GOTO850
RX 830 FOR I=0 TO B:GET#1,A$:POKE BS+I,ASC(A$+Z$):IF(I<>B)AND ST THEN F=2:AD=I:I=B
FA 840 NEXT:IF ST<>64 THEN F=3
FQ 850 CLOSE1:CLOSE15:ON ABS(F>0)+1 GOTO960,970
SA 860 INPUT#15,A,A$:IF A THEN CLOSE1:CLOSE15:GOSUB1060:PRINT"{RVS}ERROR: "A$
GQ 870 RETURN
EJ 880 POKE183,PEEK(FA+2):POKE187,PEEK(FA+3):POKE188,PEEK(FA+4):IFOP=0THEN920
HJ 890 SYS 63466:IF(PEEK(783)AND1)THEN GOSUB1060:PRINT"{DOWN}{RVS} FILE NOT {SPACE}FOUND ":GOTO690
CS 900 AD=PEEK(829)+256*PEEK(830):IF AD<>SA THEN F=1:GOTO970
SC 910 A=PEEK(831)+256*PEEK(832)-1:F=F-2*(A<EA)-3*(A>EA):AD=A-AD:GOTO930
KM 920 A=SA:B=EA+1:GOSUB1010:POKE780,3:SYS 63338
JF 930 A=BS:B=BS+(EA-SA)+1:GOSUB1010:ON OP GOTO950:SYS 63591
AE 940 GOSUB1080:PRINT"{BLU}** SAVE COMPLETED **":GOTO220
XP 950 POKE147,0:SYS 63562:IF {SPACE}ST>0 THEN970
FR 960 GOSUB1080:PRINT"{BLU}** LOAD COMPLETED **":GOTO220
DP 970 GOSUB1060:PRINT"{BLK}{RVS}ERROR DURING LOAD:{DOWN}[4]":ON F GOSUB980,990,1000:GOTO220
PP 980 PRINT"INCORRECT STARTING ADDRESS (";:GOSUB360:PRINT")":RETURN
GR 990 PRINT"LOAD ENDED AT ";:AD=SA+AD:GOSUB360:PRINT D$:RETURN
FD 1000 PRINT"TRUNCATED AT ENDING ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(AH*256):POKE193,AL:POKE194,AH
FF 1020 AH=INT(B/256):AL=B-(AH*256):POKE174,AL:POKE175,AH:RETURN
FX 1030 IF AD<SA OR AD>EA THEN 1050
HA 1040 IF(AD>511 AND AD<40960
```

```
)OR(AD>49151 AND AD<53
248)THEN GOSUB1080:F=0
:RETURN
HC 1050 GOSUB1060:PRINT"{RVS}
{SPACE}INVALID ADDRESS
{DOWN}{BLK}":F=1:RETU
RN
AR 1060 POKE SD+5,31:POKE SD+6
,208:POKE SD,240:POKE
{SPACE}SD+1,4:POKE SD+
4,33
DX 1070 FOR S=1 TO 100:NEXT:GO
TO1090
PF 1080 POKE SD+5,8:POKE SD+6,
240:POKE SD,0:POKE SD+
1,90:POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:PO
KE SD+4,0:POKE SD,0:PO
KE SD+1,0:RETURN
```

Program 2: MLX For Commodore 128

```
AE 100 TRAP 960:POKE 4627,128:
DIM NL$,A(7)
XP 110 Z2=2:Z4=254:Z5=255:Z6=2
56:Z7=127:BS=256*PEEK(4
627):EA=65280
FB 120 BE$=CHR$(7):RT$=CHR$(13
):DL$=CHR$(20):SP$=CHR$
(32):LF$=CHR$(157)
KE 130 DEF FNHB(A)=INT(A/256):
DEF FNLB(A)=A-FNHB(A)*2
56:DEF FNAD(A)=PEEK(A)+
256*PEEK(A+1)
JB 140 KEY 1,"A":KEY 3,"B":KEY
5,"C":KEY 7,"D":VOL 15
:IF RGR(0)=5 THEN FAST
FJ 150 PRINT"{CLR}"CHR$(142);C
HR$(8):COLOR 0,15:COLOR
4,15:COLOR 6,15
GQ 160 PRINT TAB(12)"{RED}
{RVS}{2 SPACES}{9 @}
{2 SPACES}"RT$;TAB(12)"
{RVS}{2 SPACES}{OFF}
{BLU} 128 MLX {RED}
{RVS}{2 SPACES}"RT$;TAB
(12)"{RVS}{13 SPACES}
{BLU}"
FE 170 PRINT"{2 DOWN}
{3 SPACES}COMPUTE!'S MA
CHINE LANGUAGE EDITOR
{2 DOWN}"
DK 180 PRINT"{BLK}STARTING ADD
RESS{4}";:GOSUB 260:IF
{SPACE}AD THEN SA=AD:EL
SE 180
FH 190 PRINT"{BLK}{2 SPACES}EN
DING ADDRESS{4}";:GOSUB
260:IF AD THEN EA=AD:E
LSE 190
MF 200 PRINT"{DOWN}{BLK}CLEAR
{SPACE}WORKSPACE [Y/N]?
{4}":GETKEY A$:IF A$<>"
Y" THEN 220
QH 210 PRINT"{DOWN}{BLU}WORKIN
G...";:BANK 0:FOR A=BS
{SPACE}TO BS+(EA-SA)+7:
POKE A,0:NEXT A:PRINT"D
ONE"
DC 220 PRINT TAB(10)"{DOWN}
{BLK}{RVS} MLX COMMAND
{SPACE}MENU {4}{DOWN}":
PRINT TAB(13)"{RVS}E
{OFF}NTER DATA"RT$;TAB(
13)"{RVS}D{OFF}ISPLAY D
ATA"RT$;TAB(13)"{RVS}L
{OFF}OAD FILE"
HB 230 PRINT TAB(13)"{RVS}S
{OFF}AVE FILE"RT$;TAB(1
3)"{RVS}C{OFF}ATALOG DI
SK"RT$;TAB(13)"{RVS}Q
{OFF}UIT{DOWN}{BLK}"
AP 240 GETKEY A$:A=INSTR("EDLS
CQ",A$):ON A GOTO 340,5
50,640,650,930,940:GOSU
B 950:GOTO 240
SX 250 PRINT"STARTING AT";:GOS
UB 260:IF(AD<>0)OR(A$=N
L$)THEN RETURN:ELSE 250
BG 260 A$=NL$:INPUT A$:IF LEN(
A$)=4 THEN AD=DEC(A$)
PP 270 IF AD=0 THEN BEGIN:IF A
$<>NL$ THEN 300:ELSE RE
TURN:BEND
MA 280 IF AD<SA OR AD>EA THEN
{SPACE}300
PM 290 IF AD>511 AND AD<65280
{SPACE}THEN PRINT BE$;:
RETURN
SQ 300 GOSUB 950:PRINT"{RVS} I
NVALID ADDRESS {DOWN}
{BLK}":AD=0:RETURN
RD 310 CK=FNHB(AD):CK=AD-Z4*CK
+Z5*(CK>Z7):GOTO 330
DD 320 CK=CK*Z2+Z5*(CK>Z7)+A
AH 330 CK=CK+Z5*(CK>Z5):RETURN
QD 340 PRINT BE$;"{RVS} ENTER
{SPACE}DATA ":GOSUB 250
:IF A$=NL$ THEN 220
JA 350 BANK 0:PRINT:F=0:OPEN 3
,3
BR 360 GOSUB 310:PRINT HEX$(AD
)+":";:IF F THEN PRINT
{SPACE}L$:PRINT"{UP}
{5 RIGHT}";
QA 370 FOR I=0 TO 24 STEP 3:B$
=SP$:FOR J=1 TO 2:IF F
{SPACE}THEN B$=MID$(L$,
I+J,1)
PS 380 PRINT"{RVS}"B$+LF$;:IF
{SPACE}I<24 THEN PRINT"
{OFF}";
RC 390 GETKEY A$:IF (A$>"/" AN
D A$<":") OR(A$>"@" AND
A$<"G") THEN 470
AC 400 IF A$="+" THEN A$="E":G
OTO 470
QB 410 IF A$="-" THEN A$="F":G
OTO 470
FB 420 IF A$=RT$ AND ((I=0) AN
D (J=1) OR F) THEN PRIN
T B$;:J=2:NEXT:I=24:GOT
O 480
RD 430 IF A$="{HOME}" THEN PRI
NT B$:J=2:NEXT:I=24:NEX
T:F=0:GOTO 360
XB 440 IF (A$="{RIGHT}") AND F
THEN PRINT B$+LF$;:GOT
O 470
JP 450 IF A$<>LF$ AND A$<>DL$
{SPACE}OR ((I=0) AND (J
=1)) THEN GOSUB 950:GOT
O 390
PS 460 A$=LF$+SP$+LF$:PRINT B$
+LF$;:J=2-J:IF J THEN P
RINT LF$;:I=I-3
GB 470 PRINT A$;:NEXT J:PRINT
{SPACE}SP$;
HA 480 NEXT I:PRINT:PRINT"{UP}
{5 RIGHT}";:L$="
{27 SPACES}"
DP 490 FOR I=1 TO 25 STEP 3:GE
T#3,A$,B$:IF A$=SP$ THE
N I=25:NEXT:CLOSE 3:GOT
O 220
BA 500 A$=A$+B$:A=DEC(A$):MID$
(L$,I,2)=A$:IF I<25 THE
N GOSUB 320:A(I/3)=A:GE
T#3,A$
AR 510 NEXT I:IF A<>CK THEN GO
SUB 950:PRINT:PRINT"
{RVS} ERROR: REENTER LI
NE ":F=1:GOTO 360
DX 520 PRINT BE$:B=BS+AD-SA:FO
R I=0 TO 7:POKE B+I,A(I
):NEXT I
XB 530 F=0:AD=AD+8:IF AD<=EA T
HEN 360
CA 540 CLOSE 3:PRINT"{DOWN}
{BLU}** END OF ENTRY **
{BLK}{2 DOWN}":GOTO 650
MC 550 PRINT BE$;"{CLR}{DOWN}
{RVS} DISPLAY DATA ":GO
SUB 250:IF A$=NL$ THEN
{SPACE}220
JF 560 BANK 0:PRINT"{DOWN}
{BLU}PRESS: {RVS}SPACE
{OFF} TO PAUSE, {RVS}RE
TURN{OFF} TO BREAK{4}
{DOWN}"
XA 570 PRINT HEX$(AD)+":";:GOS
UB 310:B=BS+AD-SA
DJ 580 FOR I=B TO B+7:A=PEEK(I
):PRINT RIGHT$(HEX$(A),
2);SP$;:GOSUB 320:NEXT
{SPACE}I
XB 590 PRINT"{RVS}";RIGHT$(HEX
$(CK),2)
GR 600 F=1:AD=AD+8:IF AD>EA TH
EN PRINT"{BLU}** END OF
DATA **":GOTO 220
EB 610 GET A$:IF A$=RT$ THEN P
RINT BE$:GOTO 220
QK 620 IF A$=SP$ THEN F=F+1:PR
INT BE$;
XS 630 ON F GOTO 570,610,570
RF 640 PRINT BE$"{DOWN}{RVS} L
OAD DATA ":OP=1:GOTO 66
0
BP 650 PRINT BE$"{DOWN}{RVS} S
AVE FILE ":OP=0
DM 660 F=0:F$=NL$:INPUT"FILENA
ME{4}";F$:IF F$=NL$ THE
N 220
RF 670 PRINT"{DOWN}{BLK}{RVS}T
{OFF}APE OR {RVS}D{OFF}
ISK: {4}";
SQ 680 GETKEY A$:IF A$="T" THE
N 850:ELSE IF A$<>"D" T
HEN 680
SP 690 PRINT"DISK{DOWN}":IF OP
THEN 760
EG 700 DOPEN#1,(F$+",P"),W:IF
{SPACE}DS THEN A$=DS$:G
OTO 740
JH 710 BANK 0:POKE BS-2,FNLB(S
A):POKE BS-1,FNHB(SA):P
RINT"SAVING ";F$:PRINT
MC 720 FOR A=BS-2 TO BS+EA-SA:
PRINT#1,CHR$(PEEK(A));:
IF ST THEN A$="DISK WRI
TE ERROR":GOTO 750
GC 730 NEXT A:CLOSE 1:PRINT"
{BLU}** SAVE COMPLETED
{SPACE}WITHOUT ERRORS *
*":GOTO 220
RA 740 IF DS=63 THEN BEGIN:CLO
SE 1:INPUT"{BLK}REPLACE
EXISTING FILE [Y/N]{4}
";A$:IF A$="Y" THEN SCR
ATCH(F$):PRINT:GOTO 700
:ELSE PRINT"{BLK}":GOTO
660:BEND
GA 750 CLOSE 1:GOSUB 950:PRINT
"{BLK}{RVS} ERROR DURIN
G SAVE: {4}":PRINT A$:G
OTO 220
FD 760 DOPEN#1,(F$+",P"):IF DS
THEN A$=DS$:F=4:CLOSE
{SPACE}1:GOTO 790
```

```
PX 770 GET#1,A$,B$:CLOSE 1:AD=
       ASC(A$)+256*ASC(B$):IF
       {SPACE}AD<>SA THEN F=1:
       GOTO 790
KB 780 PRINT"LOADING ";F$:PRIN
       T:BLOAD(F$),B0,P(BS):AD
       =SA+FNAD(174)-BS-1:F=-2
       *(AD<EA)-3*(AD>EA)
RQ 790 IF F THEN 800:ELSE PRIN
       T"{BLU}** LOAD COMPLETE
       D WITHOUT ERRORS **":GO
       TO 220
ER 800 GOSUB 950:PRINT"{BLK}
       {RVS} ERROR DURING LOAD
       : £4¾":ON F GOSUB 810,8
       20,830,840:GOTO220
QJ 810 PRINT"INCORRECT STARTIN
       G ADDRESS (";HEX$(AD);"
       )":RETURN
DP 820 PRINT"LOAD ENDED AT ";H
       EX$(AD):RETURN
EB 830 PRINT"TRUNCATED AT ENDI
       NG ADDRESS ("HEX$(EA)")
       ":RETURN
FP 840 PRINT"DISK ERROR ";A$:R
       ETURN
KS 850 PRINT"TAPE":AD=POINTER(
       F$):BANK 1:A=PEEK(AD):A
       L=PEEK(AD+1):AH=PEEK(AD
       +2)
XX 860 BANK 15:SYS DEC("FF68")
       ,0,1:SYS DEC("FFBA"),1,
       1,0:SYS DEC("FFBD"),A,A
       L,AH:SYS DEC("FF90"),12
       8:IF OP THEN 890
FG 870 PRINT:A=SA:B=EA+1:GOSUB
        920:SYS DEC("E919"),3:
       PRINT"SAVING ";F$
AB 880 A=BS:B=BS+(EA-SA)+1:GOS
       UB 920:SYS DEC("EA18"):
       PRINT"{DOWN}{BLU}** TAP
       E SAVE COMPLETED **":GO
       TO 220
CP 890 SYS DEC("E99A"):PRINT:I
       F PEEK(2816)=5 THEN GOS
       UB 950:PRINT"{DOWN}
       {BLK}{RVS} FILE NOT FOU
       ND ":GOTO 220
GQ 900 PRINT"LOADING ...{DOWN}
       ":AD=FNAD(2817):IF AD<>
       SA THEN F=1:GOTO 800:EL
       SE AD=FNAD(2819)-1:F=-2
       *(AD<EA)-3*(AD>EA)
JD 910 A=BS:B=BS+(EA-SA)+1:GOS
       UB 920:SYS DEC("E9FB"):
       IF ST>0 THEN 800:ELSE 7
       90
XB 920 POKE193,FNLB(A):POKE194
       ,FNHB(A):POKE 174,FNLB(
       B):POKE 175,FNHB(B):RET
       URN
CP 930 CATALOG:PRINT"{DOWN}
       {BLU}** PRESS ANY KEY F
       OR MENU **":GETKEY A$:G
       OTO 220
MM 940 PRINT BE$"{RVS} QUIT
       £4¾";RT$;"ARE YOU SURE
       {SPACE}[Y/N]?":GETKEY A
       $:IF A$<>"Y" THEN 220:E
       LSE PRINT"{CLR}":BANK 1
       5:END
JE 950 SOUND 1,500,10:RETURN
AF 960 IF ER=14 AND EL=260 THE
       N RESUME 300
MK 970 IF ER=14 AND EL=500 THE
       N RESUME NEXT
KJ 980 IF ER=4 AND EL=780 THEN
        F=4:A$=DS$:RESUME 800
DQ 990 IF ER=30 THEN RESUME:EL
       SE PRINT ERR$(ER);" ERR
       OR IN LINE";EL
```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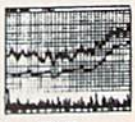

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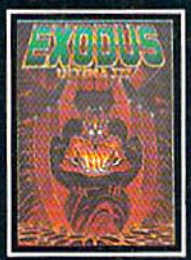

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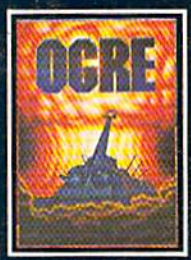

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